Farmers' Perception and Attitude to Recreational Hunting Leases in Central and South Saskatchewan

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ABSTRACT

The purpose of this thesis was to investigate Saskatchewan farmers' perception of lease hunting in Southern and Central Saskatchewan. Wildlife habitat on privately owned farmland has been shown to provide significant public benefits to society at large. One method that has been shown to provide a greater private benefit to the providers of wildlife habitat is lease hunting which creates incentives to farmers to provide some of the direct use value of wildlife habitat. Since lease hunting with the current legal structure is not an option in the province of Saskatchewan, this study investigated farmers' attitude to a hypothetical lease hunting option. A total of 84 in person surveys were administered to Saskatchewan farmers and 10 telephone interviews to outfitters operating in the province. The survey results indicated that Saskatchewan farmers are evenly split between supporting and failing to support the introduction of lease hunting. Econometric analysis using a probit model showed that farmers who are renting additional land to agricultural production, who allowed hunting on their land in the past are more likely to support introducing lease hunting. Farmers who have been asked permission to hunt on their land by recreational hunters were less likely to support lease hunting, confirming the lease hunting literature that states that the most important characteristics of lease hunting is the control over who accesses their land. Since farmers who have already been asked for permission to access their land already possess the control over their land they were less likely to support the introduction of lease hunting. Demographic variables such as age and education do not have an effect on attitude to lease hunting. The price of a day hunting lease was estimated among those farmers who were in support of introducing lease hunting. It seems farmers are willing to accept $90 per day for a day of recreational hunting access to their lands. A tobit model showed that farmers who rent more land for agricultural production would charge more for a day of recreational hunting access. Also those farmers who have high perceived quantity of wildlife on their land would charge more up to a certain point where wildlife nuisance quality becomes more prominent.

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

$	Canadian Dollar
US $	US Dollar
BLM	Binomial Logistic Model
BMP	Block Management Program
CE	Choice Experiment
CHAP	Controlled Hunting Access Program
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CS	Consumer Surplus
CVM	Contingent Valuation Method
CWA	Canada Wildlife Act
CWMU	Cooperative Wildlife Management Unites
EU	European Union
GHA	General Hunting Access
HLN	Hunting Lease Network
HMP	Hunter management Program
LIP	Landowner Incentive Program
MBCA	Migratory Birds Convention Act
NOAA	National Oceanic and Atmospheric Administration
OLS	Ordinary Least Square
PLOT	Private Land Open to Sportsmen
RM	Rural Municipality
RMs	Rural Municipalities

SARA	Species at Risk Act
SIWC	Survey on the Importance of Wildlife to Canadians
SK	Saskatchewan
SOA	Saskatchewan Outfitters Association
SWF	Saskatchewan Wildlife Federation
TCM	Travel Cost Method
US	United States of America
USSR	Union of Soviet Socialistic Republics
WAPPRIITA	Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act
WHPA	Wildlife Habitat Protection Act
WIP	Walk-In Area Program
WTA	Willingness to Accept
WTP	Willingness to Pay

Chapter One

Introduction

1.1 Background

In the Province of Saskatchewan, wildlife on private land has a mixture of public good and private good characteristics. The extent of property rights recognized on private land enables farmers to deny anyone access to their land. However, wildlife is vested in the crown such that the farmer is not permitted to charge a fee to individuals to access wildlife that is located on their land. Specifically, current institutional arrangements in Saskatchewan do not allow the selling or renting of access rights for the withdrawal of wildlife (Bill-60, 1998)[1].

There are significant motivations for farmers to maintain wildlife habitat on their land based on their value system or preferences such as enjoying non-consumptive benefits of wildlife, or the legally limited opportunities landowners have to harvest wildlife on their land. However, there are many institutional characteristics that result in private landowners in Saskatchewan allocating limited land to wildlife habitat, and in turn wildlife populations, for society. In addition, the farmer will often be subject to the costs imposed by having wildlife on their land such as the opportunity cost of maintaining wildlife habitat areas. Moreover, the Canadian government has committed significant payments through Agriculture and Agri-Food Canada, to support the production of agricultural commodities (Government of Canada, 2011) through direct and indirect payments to the Canadian agricultural sector. This contributes to conditions, economic and otherwise, that makes wildlife habitat relatively more expensive to maintain on

[1] Saskatchewan's Wildlife Act (Bill-60, 1998) explicitly prohibits charging for hunting access in section 43: "*Sale of hunting rights: (43) Subject to this Act and the regulations, no person shall, directly or indirectly sell, trade or barter the hunting rights for wildlife on any land.*"

agricultural land thereby exacerbating the under provision of wildlife habitat from society's perspective.

1.1.1 Canadian Wildlife Legislation

There are four primary federal-level Acts governing the status of Wildlife in Canada: The Canada Wildlife Act (CWA) (1985); Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act 1992 (WAPPRIITA), the Migratory Birds Convention Act (MBCA) (1994) the act addressing the protection of endangered and threatened wildlife species in Canada, and the Species at Risk Act (SARA) (2002). All four federal-level acts are binding on Canada and the province.

The CWA defines wildlife as any animal, and its habitat that is wild by nature. The WAPPRIITA controls both international and interprovincial trade in both wild animals and plants as they are defined under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Donihee, 2000). The MBCA deals with migratory birds as listed in the Migratory Bird Convention. Hunting of migratory birds is regulated through the Migratory Game Bird Hunting Regulations, which are reviewed every year and updated according to prevailing circumstances and conditions (Environment Canada, 2011). SARA has a double purpose: its first goal is to prevent the extinction or extirpation of endangered species and also to prevent sensitive species from becoming endangered (Donihee, 2000). The SARA applies to land under both federal and provincial jurisdiction, however is only relevant to species at risk and as a result does not directly concern game species.

In Saskatchewan, the Saskatchewan Wildlife Act (Bill-60, 1998), regulates who can hunt in the province and under which circumstances. The wildlife management tools such as hunting licenses and 'enforced/monitored' hunting regulations are assigned to different agencies both at

the federal and provincial levels. At the provincial level the Ministry of Environment issues the hunting licenses however migratory birds fall under federal jurisdiction due to the MBCA. According to Saskatchewan law the Crown owns wildlife (Bill-60, 1998) and as such every citizen should have equal access to it. However, equal access to wildlife for all the residents of Saskatchewan is complicated, especially in the southern, agricultural region of the province, where 66% of the Saskatchewan land base is privately owned farmland (Statistics Canada, 2006). Another important provincial law was introduced in 1984: the Wildlife Habitat Protection Act (WHPA, 1992[2]). This act deals with crown land. It prohibits the selling of designated Crown land and also places restrictions on lessees as to the kind of activities they can use the land for. This act protects millions of acres of wildlife habitat in the agricultural region; its effect however is limited to Crown land.

In Saskatchewan the owner or the occupant of the land has the right to deny access to his or her land and thereby deny access to the wildlife vested in the Crown. At the same time, under Saskatchewan law, landowners are explicitly forbidden from charging a fee to recreational hunters to access their land (Bill-60, 1998). It is important to note that on private land access is only partially controlled by the private land owner. The landowner has the right to post land by erecting signs that prohibit hunting, or even posting the land for no trespassing, thus restricting access to the land and thereby restricting access to the wildlife residing on the land. However, in the case the landowner chooses not to post land against hunting or trespassing, then recreational hunters have the right to access the land for the purpose of accessing wildlife. In practical terms this institutional structure results in a situation that if the landowner has experienced or expects that she will endure more negative than positive impacts accommodating strangers on her land,

[2] http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/W13-2.pdf

she will post the land and will have full control over who will be able to access wildlife on her land.

Land access rights are important to understand when considering the contribution and use of wildlife in rural Saskatchewan. As ownership of wildlife is vested in the crown and it is a controversial area of policy or legislation for two main reasons. First, this mainly has to do with wildlife being a public good and the view that wildlife has to remain a public good otherwise it gets exploited (Geist, 1989). Second, North-America, especially the US, was founded under the influence of the French revolution, free hunting and the public good nature of wildlife is a crucial and very important part of the North American identity. It is very likely that changing the public good nature of wildlife would result in significant resentment against the privatization of wildlife. While focusing on the land access issue it is easier to "sell" politically; while still giving compensation to landowners for the provision of a public good (wildlife) on a private good (farmland). In reality the policy maker achieves similar results without causing much controversy.

Hunting regulation in Saskatchewan focuses on setting specific seasons which represent the periods of time when hunting of specific game species is permitted based on the hunting weapon used. For example, during the 2009 Saskatchewan hunting season white-tailed deer hunting with archery and crossbow was allowed from September 1 to December 7, with muzzleloader from October 1 to October 31, and with rifle from November 15 to December 7 in the Southern-Central part of SK during the 2009 hunting season (Saskatchewan Hunters and trappers guide, 2009). During the stated time hunters are eligible to bag one white-tailed, either sex deer. The province sets harvest limits based on annually collected population data, collected by the ministry of Environment. The rules are enforced by

conservation officers representing the Provincial Fish and Wildlife Branch. Within Saskatchewan wildlife game species population are highly variable year to year and across the province. To enable management of these regional populations the province has established a total of 76 Wildlife Management Zones (WMZs) and two Game Bird Districts South and North (The Wildlife Act, 1990; Saskatchewan Ministry of Environment, 2008). Each of these smaller wildlife management units enable the application of different wildlife management tools, by allowing hunting in different times and for different groups of hunters (The Wildlife Act, 1990). The boundaries of WMZs are constantly changing, reflecting the continuous changes in wildlife population's quality and quantity.

Currently, hunters in Saskatchewan are divided into three groups based on residency: Saskatchewan resident hunters referred to as local hunters, Canadian resident hunters that are not Saskatchewan residents, referred to as Canadian hunters, and foreign resident hunters, referred to as foreign hunters. Within the province any Saskatchewan resident, with a valid hunting license, can hunt in the southern part of Saskatchewan unless, as discussed earlier, the land is posted with certain hunting or access restrictions. Local hunters are allowed to hunt white-tailed deer throughout the province; while Canadian residents have some restrictions on the area where they can hunt, the real difference are for the foreign hunters who are only allowed to hunt in Northern WMZs. In addition, foreign hunters are also required to use the service of a registered outfitter (Saskatchewan Ministry of Environment, 2008).

Hunting license fees in Saskatchewan are comprised of two different aspects, a fixed fee of $10.79 which is paid by all hunters no matter what species they are intending to harvest, and a game species specific license fee. The fixed fee is called the wildlife habitat certificate that has to be purchased once per year to validate any game animal license. In the event the

hunter wants to hunt for waterfowl it is necessary to purchase a federal migratory bird license, besides the mandatory wildlife habitat certificate and a game bird license (Saskatchewan Ministry of Environment, 2008). Prices for game species specific license are set based on the different species and for different hunters[3]. Conacher (1997) argued that the different prices reflect the sentiment that non-local hunters do not bear the cost of lack of wildlife therefore they are more likely to use the resources in a careless way.

According to the Saskatchewan Ministry of Environment[4] (Fish and Wildlife Development Fund, 2008) 30% of all revenue from habitat certificates and hunting licenses goes to the Fish and Wildlife Development Fund (FWDF). The FWDF provide significant funding to the Saskatchewan Wildlife Federation (SWF), which is wildlife and hunting advocacy organization (SWF, 2008) representing, primarily, the Saskatchewan resident consumers of wildlife (hunters). The remaining 70% of habitat certificate revenues goes into the general revenue of the Ministry of Environment budget. These fees are designed to offset some of the cost related to wildlife management. It is important to note that interaction between consumers and producers of hunting goods and services in the province of Saskatchewan does not occur, for the most part, in a classical market sense where producers and consumers are not interacting directly through a price mechanism.

1.2 Problem Statement

Privately owned agricultural land in Saskatchewan is valued for providing a range of ecosystem goods and services, in addition to the production of agricultural commodities. These

[3] For example, local hunters in 2009 paid $32.38, Canadian hunters $137.38, and foreign hunters $274.76 for an either sex white-tailed deer license (Saskatchewan Ministry of Environment, 2008a).
[4] Telephone conversation with the Ministry of Environment on 2008/November/19th tel: 1-800-567-4224/5. Follow up with Steve Porter, habitat protection specialist, (306)787-2385.

ecosystem goods and services such as wildlife and wildlife habitat generate direct use, indirect use, non-use, and option use values.

Landowners may not perceive strong incentives to provide wildlife habitat and in fact having wildlife habitat on their land can impose significant private costs. However, wildlife does provide a wide range of public goods that generate indirect use, non-use, and option use values. The current legislative and institutional characteristics make it difficult or impossible for landowners to capture any of these public or external benefits of wildlife provision.

Currently in Saskatchewan landowners cannot sell recreational hunting access to hunters due to legal restrictions under Bill-60. At the same time, some of the public's wildlife resides on private land to which the access is controlled by the landowner. In the event a landowner decides to provide wildlife and wildlife habitat on her farm she will generate a positive public externality to society at large and to a very well defined portion of it represented by recreational hunters who access her land. Since farmers provide wildlife habitat on private land, thereby creating a significant positive public externality for which they are not compensated results in an incentive to under provide wildlife habitat on private land.

This research focuses on evaluating the attitudes, primarily of private landowners, hereafter farmers, towards a hypothetical compensation mechanism that would internalize some of the positive public externality generated by private landowners in SK. The program instrument examined is a market-based mechanism as represented by the selling of recreational hunting access to private land that would enable landowners to charge a fee for recreational hunting access, in the form of hunting leases.

1.3 Objectives

The primary objective of this research is to examine Saskatchewan farmers' perception of the development of an approach that would enable the establishment of recreational hunting leases that allows Saskatchewan landowners to charge recreational hunters a fee to access their private land. The specific objectives of this research were:

1. To develop a conceptual model that demonstrates how landowners (i.e. farmers) and consumers (i.e. recreational hunters) would interact within a recreational lease hunting market to trade direct private land access rights for recreational hunting.
2. To quantify and/or qualify the perceived value and attitudes of farmers toward recreational hunting leases in Saskatchewan.
3. Develop recommendations for the implementation of recreational leases in southern Saskatchewan including institutional structure and administration.

1.4 Methods

A theoretical framework was developed that represents the relative values of landowners and wildlife users, including recreational hunters, of wildlife provided by an agricultural landscape. This model will be used to develop insights into the incentives facing the various wildlife stakeholders and the benefits and costs from the introduction of recreational hunting leases in Saskatchewan. It also helps to understand the expected performance of a recreational hunting lease approach to changing the interactions between hunters (consumers) and farmers (producers).

To develop an understanding of the attitude and the supply - demand towards recreational hunting leases in Saskatchewan, surveys were conducted with selected Saskatchewan farmers and outfitters. In addition to questions related to the demand for wildlife related goods and

services, outfitters were asked about the amount they would be willing to pay for access to privately owned land. To estimate the monetary value of the supply side of recreational hunting leases in Saskatchewan, a sample of farmers were surveyed. Areas of the province were chosen where there is significant hunting activity.

Based on the conceptual framework, the data from the surveys were analyzed. Using standard statistical methods to produce descriptive statistics and applying econometric tools to run Tobit regression and a binomial probit model to understand preferred policy directions. In addition, I evaluated the impact of different stakeholders' perception on changing the land access rights and the influence of various stakeholder characteristics on their perceptions.

1.5 Thesis Organization

Chapter two develops the theoretical framework that is used in the research. Chapter three describes the data collection method. Chapter four provides the main findings underlined with a summary of the statistical characteristics of the data and econometric analysis and discussion of the insights gained from the data gathered. Finally Chapter five provides concluding comments and summarizes the main findings of the research, discussing several alternative policy options. The chapter concludes with recommendations for further research.

Chapter Two

Theoretical framework

2.1 Introduction

This chapter focuses on developing an economic model that can be used to evaluate the management incentives that are apparent to private farmers with respect to wildlife habitat provision. This model will also be used to inform the development of policies to meet wildlife habitat objectives.

2.2 Value of wildlife for humans

One of the important characteristics of property rights to enable efficient resource allocation is exclusivity in resource usage or exclusive use of the benefit stream from the property, such that the property's owner is able to exclude unwanted users. However, when considering natural resources and environmental management, exclusivity is often violated since there are benefits associated with natural resources that are captured by other agents or society in general (Krutilla, 1967; Hardin, 1968). As a result, the value of these benefits are either not represented or incompletely represented to decision makers. It is helpful to describe, or where it is possible to define, the values attached to wildlife and wildlife habitat, since without some representation of value it is difficult to interpret the social, and private, costs of allocation of the above resources.

In order to interpret the allocation of ecosystem goods and services there needs to be some characterization of value including direct use and indirect use values. Use values are further classified as either direct use value or indirect use value (McNelly et al., 1990). Direct use value can be classified as consumptive direct use value and non-consumptive direct use value.

Consumptive direct use value represents values derived from activities such as harvest and removal of wildlife through hunting and fishing, while non-consumptive direct use value includes activities that provide benefits to the resource user that does not require the removal of the resource such as the benefit derived from the recreational value of the act of hunting, wildlife viewing, taking pictures and other non-extractive recreational activities.

Indirect use value includes those values associated with the goods and services provided by, for example, the water filtering benefits by ecosystems or the genetic variability provided by biodiversity. In contrast, non-use value includes existence and bequest value, where existence value represents benefits to individuals and society through the knowledge, that there is wildlife present and bequest value is defined as a benefit derived that the resource that exists today might be available for future generations (Krutilla, 1967; Walsh et al., 1984; van Kooten, 2004). Option Value is often categorized as a third category between use and non-use value[5] as the option for future usage is undetermined and potentially could be either use or non-use. Existence, bequest, option value, and even indirect use values of wildlife habitat are hard to quantify (Edward and Abivardi, 1998) as they have public good characteristics and even harder to design policy mechanisms to make it attractive to farmers to provide.

Developing a more complete representation of value for wildlife, and the range of associated goods and services, can help to inform decision making to reduce the under provision of wildlife habitat. One way that provision of wildlife habitat can be addressed is through a

[5] Some authors consider option value a non-use value along with bequest and existence – the agent is not using the resource to gain value; however, I favor Krutilla and Walshe's interpretation and find it more nuanced, categorizing option value as an in between category between use and non-use value as at the present moment the option value represents all the future value of both use and non-use value. In other words at the present moment it has the potential to go either way. I think the difference between the two interpretation lies between the perspective of the person making the categorization. In Krutilla and Walsh's perspective they look at the value throughout time while the alternative interpretation looks at the resources at a single point in time: now.

policy approach that focuses on the easily measurable direct use value of wildlife that can be transformed to a type of private good which can be sold through a market-based mechanism.

2.3 An Economic Model of Land Allocation

The values that wildlife habitat and wildlife provide, including the range of private and public, use and non-use values, are important in understanding land allocation decisions and provision of wildlife habitat on privately owned land. Wildlife habitat and the associated wildlife provide both types of direct use value: non-consumptive use value in the form of aesthetics or the benefit of enjoying the beauty of wildlife and wildlife habitat, and also creates potentially recreational value of hunting to the private land owner. Also the habitat can provide direct consumptive use value if the farmer happens to be a hunter.

The economic characteristics that lead to an under provision of wildlife habitat[6] on private land are demonstrated in Figure 2.1. The vertical axis represents the value of wildlife habitat set aside on private land, expressed in Canadian dollars and the horizontal axis represents the quantity of wildlife habitat set aside expressed in hectares. Consistent with theory, the initial units of wildlife habitat will be valued at a relatively high level as represented by the marginal benefit function (MB). Then, according to the law of diminishing marginal utility, the negative slope of the $MB_{private}$ curve reflects that additional hectares of land allocated to wildlife habitat provide less and less marginal private benefit for the land owner. This continues up to a point

[6] It is important to note that there are government and non-governmental programs subsidising wildlife habitat preservation and also non-negligible non-marketable, but personally valued use or non-use values. Saskatchewan's browsing damage compensation program (Paid out $9.5 million, during the 2010/11 fiscal year (Government of Canada, 2011)) creates incentives, which provides an incentive for farmers to tolerate wild animals on the farmland, and at the same time create hunting opportunities for recreational hunters.

where the marginal private benefit of additional wildlife habitat approaches zero.

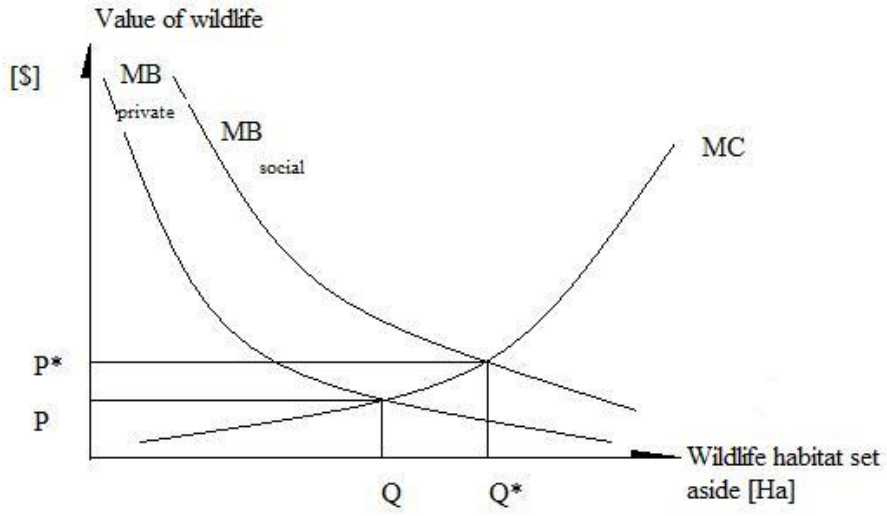

Figure 2.1: Conceptual model representing wildlife habitat allocation on private farmland in south and central Saskatchewan (Source: Author).

Within this economic model the cost of providing wildlife habitat on private land is composed of a number of factors but will largely reflect the opportunity cost of the land allocated to wildlife habitat. Within an agricultural landscape the opportunity cost will be represented, primarily, by the value of agricultural commodities that could be produced on that land. This is represented in Figure 2.1 by the upward sloping marginal cost function (MC) which reflects a low marginal cost of wildlife habitat provision associated with the initial areas of farm land allocated to wildlife habitat. As the area of land allocated to wildlife habitat increases the upward slope of the MC curve reflects the fact that the opportunity cost of this allocation increases. In this model I also assume that there are no external costs associated with the conservation of

wildlife habitat, hence the MC curve represents all of the public and private costs of wildlife habitat provision.

These private MB and MC functions can be used to identify, and understand the incentives that determine the quantity of wildlife habitat provided by private landowners. The intersection of the private MB and MC curve determines the privately efficient quantity of land allocated to wildlife habitat on private agricultural land as represented by Q (Figure 2.1). The model indicates that the farmer will be unwilling to allocate more land than Q to wildlife habitat since each additional unit of land allocated to wildlife habitat greater than Q imposes greater private costs than private benefits. In the absence of any policy intervention Q would be the anticipated level of wildlife habitat provision.

Values provided by wildlife are categorized into two main groups: direct use and other than direct use, such as non-use and indirect values. In Figure 2.1, the social MB curve captures the private MB plus the external benefit captured by society as provided by farmers allocating land to wildlife habitat. Given the earlier assumption that all of the costs of wildlife habitat provision are captured by the farmer, there are no external costs associated with wildlife habitat provision, the intersection of MC and the social MB gives the socially optimal allocation of land to wildlife habitat on private land noted as Q*. Clearly there is a gap between Q and Q* and this represents, from society's perspective, the undersupply of wildlife habitat[7] on private land as provided through private land allocation decisions motivated by economic and other forms of incentives.

[7] It is important to note here, that although the economic model and to some extent the motivation for lease hunting, is that private farmers tend to undersupply wildlife habitat. However, in a few sub regions of Saskatchewan certain big game animals most typically white-tailed deer are perceived by some farmers as pest, where the demand for hunting is significantly less than the supply of games.

In the presence of this market failure the challenge is to develop policies that provide an incentive to farmers to allocate a quantity of land to wildlife habitat closer to the socially optimal quantity of Q * in Figure 2.1 or at least to approach Q* from the status quo land allocation of Q.

A feasible approach to this issue would be to differentiate benefit streams according to whether they generate direct use value or other-than-direct value such as indirect use and non-use value benefits. The differentiation is crucial as direct use value (DUV) benefits have characteristics that make them feasible to be provided within a market-based mechanism. In contrast indirect use and non-use values often have lower levels of exclusivity and rivalry making them difficult to exchange within a competitive market-based mechanism. In recognizing and separating the two benefit streams, direct use value and other-than-direct-use values, it is possible to implement policy measures that could enable Saskatchewan farmers to receive a higher portion of the direct use value created externalities than currently is feasible. These policy mechanisms can change the incentives for land allocation to farmers with a potential outcome of reallocating land patterns closer to the socially optimal described above and represented as Q* in Figure 2.1.

It is very difficult to create incentives for public good provision, which in the current context is associated mainly with indirect use and non-use values. The focus is on the correction of the under provision that can be addressed using a market-based mechanism. Market-based mechanisms most effectively target private goods and services that mostly generate direct use value. Figure 2.1 includes the full spectrum of external benefits provided by wildlife habitat while Figure 2.2 focuses strictly on direct use value of wildlife habitat. Optimal allocation in Figure 2.1 results in Q* which is greater than Q** in Figure 2.2 as Q* takes into consideration direct use, indirect use as well as non-use values of wildlife habitat. While Q** is focusing on the

portion of wildlife habitat that is able to generate direct use value that can be used in a market-based mechanism, hence it is a feasible solution unlike applying the market-based mechanism.

The current Saskatchewan laws and regulations prohibit the selling of recreational hunting accesses in SK, which means in this context that farmers are denied a portion of the external value that are currently captured by other users, mainly recreational hunters. Therefore, the benefit of wildlife habitat set aside benefits mostly others: typically recreational hunters hunting on the farmers' land that did not contribute to the cost of the wildlife set aside and are even prohibited from paying user fees for the access.

The benefits derived from recreational hunting can be categorized primarily as direct use value, which often have characteristics, such as rivalry (and excludability) that may be appropriate for market-based mechanisms of provision. Since it is possible to create a market-based mechanism for the direct use value portion of wildlife habitat set asides in farm land, one of the potential market mechanisms that could create incentives to farmers for wildlife habitat set aside maintenance and creation might be related to recreational hunting on farmland. Focusing on the direct use value (DUV) segment of wildlife and wildlife habitat, which includes both consumptive and non-consumptive use, the following model can be established (Figure 2.2). The marginal benefit of direct use value for farmers: MB'_{DUV} and the marginal benefit of direct use value for others, typically recreational hunters: MB''_{DUV} results in:

$$MB_{DUV}=MB'_{DUV}+MB''_{DUV} \quad (2.1)$$

The intersection of MC and the three types of MB curves results in three different levels of wildlife habitat allocation. The lowest and current level is at Q' which takes into consideration the farmer's direct use value benefits and his marginal cost. Also Q' is equivalent to the Q level allocation in Figure 2.1. The middle level Q'' represents recreational hunters' direct use value

marginal benefit and Q** consider both farmers' and recreational hunters direct use value benefits.

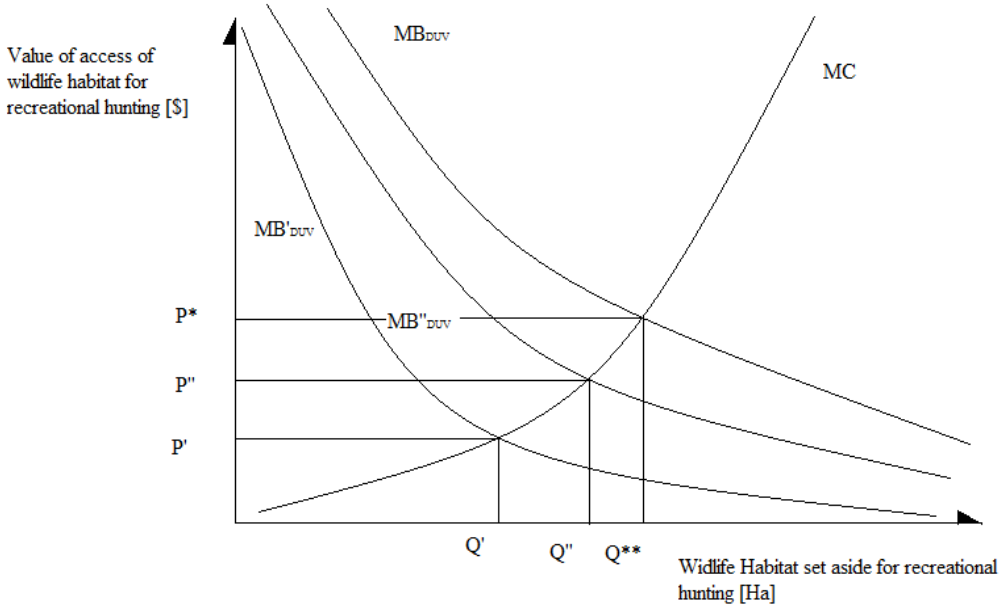

Figure 2.2: Representation of the positive externality provided by Saskatchewan farmers to recreational hunters represented by direct use value (Source: Author)

One of the potential connections between DUV of wildlife habitat on private land and recreational hunting that can be controlled by a market mechanism is the buying and selling of the access to these lands to recreational hunters. It is important to reiterate from Chapter 1.1.1 that access rights to game animals for the purpose of hunting is limited by Saskatchewan law. The hunting licence system restricts the number of hunting game licences that any individual can hold. As a result, the landowners, who have unrestricted access to the land itself, are limited in the number of animals that they can harvest from their land. As a result, the values the landowner gets from their direct consumption of wildlife are constrained by the provincially enforced restrictions on harvest. Depending on the area of the province where the land is located, harvest

restrictions vary from zero animals (for areas with low wildlife populations) to more than one animal (in areas with abundant wildlife) (Saskatchewan Ministry of Environment, 2008a). For other recreational hunters who can be granted hunting access by the landowner the marginal benefit function will represent the benefits gained by these users. These individual recreational hunters face the same constraints on the number of game animals they can harvest as the landowner. By introducing a market mechanism, the direct use value of having wildlife and wildlife habitat transfers from others (mainly recreational hunters) to farmers, through the exchange of an access fee paid by the hunter to the farmer, thereby shifting the farmers' demand curve for wildlife and wildlife habitat to the right (Figure 2.2). By introducing lease hunting, or another type of fee for hunting access mechanism, farmers may able to internalize some of the external benefits that were initially generated by farmers by the allocation of some of their land to wildlife habitat which benefits recreational hunters.

2.4 Policy Solutions

There are two main branches of policy solutions for a natural resource provision problem. The first types of policies can be categorized as incentive based and the second are direct public actions. Both branches have their advantages and disadvantages and to decide which solution to use is often not obvious. In this thesis, wildlife and wildlife habitat on private land have been identified as the natural resource of interest. Incentive-based policies include market mechanisms or government taxes and subsidies, while direct public action types of policies include command and control solutions or direct public production. In a range of jurisdictions policy makers use a mixture of these policy measures to reach, or at least to approach, a socially optimal allocation of wildlife and wildlife habitat resources. Economic theory shows that changing institutions such as introducing lease hunting in areas where it was previously

prohibited might introduce an incentive to farmers to increase wildlife habitat on their private land, which might increase wildlife population.

Currently there is no direct market incentive for the private landowner to invest in the welfare of wildlife and wildlife habitat located on their land. There are also perceived liability issues, previous negative experiences with hunters, including crops and fences damaged by hunters, and lack of economic incentives (Wright and Kaiser, 1986) which all adds up and it is in some of the cases enough for farmers to post their land against hunting.

2.5 Conclusion

Farmers will tend to provide environmental goods and services such as wildlife and wildlife habitat at a socially suboptimal level. With the current set of rules in Saskatchewan, that is wildlife being a public good and hunting rights allocated with the help of a centralized government agency under the license framework, theory suggest that more land is allocated to agricultural production as opposed to wildlife habitat than is socially optimal. To address the public good externality one of the public policy option is to enable farmers to receive increased private benefits of wildlife by allowing them to sell recreational hunting access on their land in the form of hunting leases to recreational hunters. Implementing such policy option however has to be informed by the stakeholders' perception as the perceived position on lease hunting could influence the policy design. In order to obtain a better understanding of the perception of stakeholders' on the introduction of lease hunting first the major stakeholders need to be identified. In the model developed in this chapter, farmers have been identified as the group who will be affected the most by such policy change.

Chapter Three

Data collection and data analysis methodology

3.1 Introduction

This chapter provides an overview of the related lease hunting literature to provide a research context for the present study. The chapter describes the study area and highlights the socio-economic background of the sample populations. The chapter then describes the survey development and the methods used to administer the surveys, first to Saskatchewan farmers followed by a sample of Saskatchewan outfitters. Finally I describe the econometric methods that were used to analyze the survey data.

3.2 Lease hunting literature review

Outside of Canada a large number of jurisdictions allow private landowners to charge individuals, or groups, to access their land to hunt or fish. The institutions have been set up to allow willing landowners to sell access to their land through fee hunting or lease hunting. The main difference between hunting leases and fee hunting is that fee hunting, even though access is provided to private land, it does not grant any exclusive right to either to the land or to the wildlife residing on it. In practical terms the non-exclusive right (McCabe, 1989) to access private land, means that the hunter has no conveyable estate to the land (Mozumder et al., 2007) and has to share the accessed land with other hunters who also pay a fee for the access. Fee hunting contracts are usually short term, typically for a day a week or, at a maximum, a season. Landowners can discontinue the agreement anytime. In contrast, a hunting lease agreement usually grants exclusive use rights to the lessee over the landowner's land that cannot be discontinued at the landowners' discretion (McCabe, 1989). Hunting leases can last for several

years and in the extreme even can be represented as a perpetual lease. The importance of hunter expenditures to local and regional economies in the US was suggested in a study by Munn et al (2010). Based on 2006 expenditures by anglers, hunters and wildlife-watchers in the Southeast region of the US these authors reported that $33 billion were spent with $11 billion in indirect impacts and $9.6 billion in induced impacts and generated 0.7% of regional employment and gross output.

In the US the selling of recreational leases for hunting purposes is an important form of wildlife management and also has been shown to represent a source of income for private landowners (Baen, 1997; Benson, 1989). The observed values for hunting leases, as revealed in the markets for hunting access, primarily captures one component of wildlife use value with non-use values not being represented in the lease pricing mechanism. Several studies have been conducted to quantify the value of hunting leases. It is important to note however that according to a U.S. study by Cordell (1999) only 3% of private land owners charge a fee for recreational hunting access in the US. This study reported that the majority of landowners require only verbal permission from recreational hunters to maintain a good relationship with neighbours and maintain a good reputation (Cordell, 1999). In a complementary area of research Ribaudo (2008) argued that a barrier to establishing lease hunting in the USA is peer pressure, as in many states those who are providing lease hunting earned a bad reputation, since hunting access traditionally was provided free of charge through informal verbal agreements. Knoche and Lupi (2007) reported that farmers provide wildlife and other ecological goods and services for non-economic reasons such as fairness and personal enjoyment of wildlife related non-consumptive goods. These authors stated that private farmland with non-agricultural wildlife habitat set-asides is richer in wildlife and biodiversity than the same land used solely for the production of

agricultural commodities. Mozumder et al. (2007) reviewed several studies that estimated willingness-to-accept (WTA) and willingness-to-pay (WTP) values for US hunting opportunities and concluded that it is a very hard task to compare the results since each study used different estimation techniques and methodology. Moreover these studies found that characteristics of the land and the lease (eg. length and type of lease), quality of wildlife available, the distance from urban centers, the vegetation etc. influenced the value of the recreational hunting leases or fees. However, summarizing the findings provides a general indication of the value of hunting leases and fees.

The value of hunter access to private land was found to be highly variable across the US according to a collection of relevant studies. In a meta-analysis of a number of relevant studies Cordell et al. (1999) found the observed hunting lease rates for the whole United States ranged from $18.8 to $31.33/acres/year. Also, Gray's (1998) WTA estimate for a year of hunting lease, for the whole US, was $9.91/acre. In a more spatially specific analysis Porter et al. (1996) surveyed Oklahoma state lease hunting opportunities and found that hunting lease values ranged from $0.29/acre/year to $292.5/acre/year. Further, examining examples in Florida State, specifically for white tailed deer, the lease rates for hunting ranged between $2.96 and $11.84/acres/year (Marion, 1989). As indicated earlier, this range in value may represent opportunity cost of the land, the quality of the hunting, the quality of the scenery, the range of services or the compensation required for the inconvenience and potential liability (Mozumder et al., 2007). In a related area of research Hussain et al (2013) used land sales transactions in northern Mississippi to find that an increase in the hunting lease rate of $1.00/acre was associated with a 0.80% increase in forestland value per acre and as such hunting lease income was capitalized into forestland value at a 7.55% rate.

To complement the WTA values estimated, there is a body of literature that evaluates the WTP of hunter's to access private land. Hussain et al. (2004) found that a hunting club in Alabama State was willing to pay $ 23/acre/year while they were only required to pay $9.36/acre/year. This same study also reported that an individual hunter's WTP was $1.29/acre/year even though she was only required to pay on average $0.52/acre/year. This analysis appears to reveal a level of consumer surplus received by hunters involved in lease hunting purchase. Using a contingent valuation method Goodwin et al. (1993) estimated the stated WTP for Kansas State hunters of $103.16 for hunter per year without specifying the size of the land parcel to be accessed. According to Lupi and Knoche (2007) the average hunting lease in Texas was $100-2000 per year per gun. Further, Livengood (1983) found that the WTP for harvesting a single deer was approximately $46 (Livengood, 1983). However, Hussain et al., (2009) argued that competitively awarded, auctioned hunting leases prices are a better approximation than other open market mechanisms to approximate WTP values, and also auction mechanism generate values that are of higher quality than the estimates generated by hypothetical methods. Munn et al. (2007) found that more experienced landowners generated higher lease rates. While in the auction in the Hussain et al. (2009) study only 12% of the participants were experienced; therefore the authors concluded that over 80% of the private farmer landowners do not capture the full potential of their lease because of inexperience. In a related study Baen (1997) demonstrated that recreational hunting lease markets appears to be informal and inefficient as the different type of leases are confusing to both providers and hunters. In general, hunting access lease prices vary greatly in the US depending on wildlife abundance, diversity, availability of alternative free hunting opportunities on public land, the length of the lease, and the quality of service provided by the landowner such as trail system,

shelter, and the availability of a guide. Baen (1997) found that landowners of larger tracts of land are able to generate larger payments from hunters than owners of smaller parcels of land. Further, landowners who leased year around received better rates than landowners who sold access rights only during the hunting season.

In Canada, unlike in the USA, there are no well established hunting access lease markets. However, there has been a body of research that has valued wildlife that can be used to develop an overall picture of how Canadian society assigns monetary value to wildlife. Statistics Canada conducted three surveys as the "Survey on the Importance of Wildlife to Canadians" (SIWC) in 1981, 1987, 1991 and a "Survey on the Importance of Nature to Canadians" in1996. Fillion, DuWors, Jacquemot et al. (1994) summarized the finding of the 1981, 87 and 1991 surveys and found that wildlife is very important in the life Canadians with over 90% of the sample population reporting that they participated in some kind of wildlife related activity. According to the 1991 SIWC 89% of hunters also participated in direct non-consumptive usage of wildlife such as wildlife viewing, wildlife photography; feeding, and observation of wildlife around their hunting area. In addition, 20% of Canadians participated in direct non-consumptive use of wildlife and this behaviour remained relatively stable throughout the three SIWC, while the direct consumptive use of wildlife such as hunting has decreased from 9.8% in 1981 to 7.4% in 1991. A slightly different survey, the 1996 Importance of Nature to Canadians, (Environment Canada, 2006) gives a reflection of Canadians' appreciation of wildlife. The 1996 survey found that approximately 20% of Canadians participated in direct non-consumptive use of wildlife, which is consistent with the results from the previous three SIWC surveys. In contrast the direct consumptive use of wildlife, such as hunting, declined to approximately 5% of Canadians which fits with the trend that was observed during the SWICs. However, 10% of the respondents of

this 1996 survey stated that they were interested in participating in hunting. Those who did participate in hunting activities in 1996 hunted for 17 days on average. For the province of Saskatchewan, residents expressed values for nature related activities that were above the national average with over 85% of the adult population participating in some nature-related activity and 36% participating in wildlife related recreational activities. Over 6 % (47,000 hunters) participated in active hunting, with an average level of participation reported as 16 days or 13 hunting trips per year (Environment Canada, 2006). In total, Saskatchewan residents spent 41 million days engaged in nature-related recreational activities in Saskatchewan or 6.1 million trips and spent $387 million [8] on those trips.

Economic theory suggests that payments for goods and services by consumers serve as an incentive for providers to invest in the provision of those goods and services. This will be discussed in more detail later in this chapter. In the case of paid hunting access, then, providing payment to landowners for hunting access should increase the allocation of privately owned land to wildlife habitat and increase the investment by private landowners to the provision of goods and services demanded by recreational hunters. Ribaudo (2008) argued that farmers without market incentives will under provide environmental goods and services. However, the research reviewed below shows introducing lease hunting- as a mechanism for payment- does result in ambiguous results in terms of wildlife habitat improvement. Wiggers and Rootes (1987) reported that, based on a lease hunting survey in the US, landowners in 15 states perceived that private land leases are very important, in 15 states somewhat important and in 17 states little or no importance. Since 1975 the area of private land leased for recreational hunting has increased in 14 states, remained the same in 12 states, but no states have reported decrease in the area of

[8] Presented in 1996 Canadian dollar.

private land lease. Hellerstein (2008) reported that the likelihood of a landowner participating in a publicly supported habitat restoration program increased when the landowners have an opportunity to participate in revenue generating lease hunting. Research has also shown that in addition to the revenue generating potential of lease hunting for farmers, generating market incentives to create and maintain wildlife habitat is beneficial to the whole society.

The benefits of lease hunting contracts could include wildlife habitat improvement, more private land opening up for sportsmen and monetary compensation for private landowners to growing a game animals and compensation for access (White, 2000). According to a 1985 study only private landowner's monetary compensation was realized from existing lease hunting (Wiggers and Rootes, 1987). Interestingly, these same authors reported increases in game abundance in 18 states and no states reported a decrease in game abundance. Wildlife habitat improvement could not be linked directly to the introduction of lease hunting as 31 states stated that habitat improvements were not taking place in most of the leased lands versus eight states that reported habitat improvement.

Research into lease hunting has also highlighted the importance of the characteristics of the lease contract and that landowners value more than just the income benefits of establishing a more formal relationship with hunters. In several US states when a landowner stops providing free access for hunters, the liability shifts from the state to the landowner which shows up in increased insurance premiums (Mozumder, 2007). On the positive side landowners appreciate a lease hunting agreement between them and the hunters as it gives them a written contract and the landowner knows exactly who is on their land (Conover, 1998; Wright and Kaiser, 1986; Hussain, 2005). Research has shown that for many landowners the written contract between landowners and hunters, as part of the lease hunting agreement, is often more important than the

monetary compensation (Wright and Kaiser, 1998; Hussain, 2006). The written contract ensures a mutual understanding, clearly defining rights of both parties and as such reduces uncertainties making landowners more willing to participate in the transaction. Lease hunting contracts examples represent a number of different formats, for example individual landowner administered hunting on a daily lease basis, individual landowner administered hunting leases for a season, animal based hunting and finally a third party agency broker between landowners and hunters (White, 2000, Butler et.al, 2005). A sub option of the above is when a group of landowners collectively leases hunting areas to hunters or a hunting club. Poudyal et al (2012) found that the supply of private lease hunting acres depended on certain factors including site characteristics such as the availability of certain habitats, location and infrastructure characteristics such as road networks and proximity to population centers and wildlife management areas and finally the presence of government payment programs to landowners as part of habitat enhancement programs.

Research into lease hunting has also revealed a number of specific concerns with establishing and implementing lease hunting contracts. White (2001) reported that the most often cited concerns with lease hunting included that there was a danger that average local hunters would lose hunting opportunities and centralized hunting management would be impossible, that lease hunting would increase hunting pressure on public hunting areas thereby reducing the quality of hunting on government land due to decreased game populations and congestion problems, and finally lease hunting would make hunting a prohibitively expensive activity for average hunters. White (2001) highlighted in this research that the importance of these concerns will depend on the characteristics of the local area including land ownership, resource ownership and the nature of the market for hunting access. For example, the introduction of lease hunting

brings in more changes when the availability of public land is scarce. In the state of Texas only 2% of the land is public land and virtually 100% of state wildlife lives on private land, making hunting on private land the only option. More importantly only eight states reported that hunting opportunities has increased after the introduction of lease hunting and in 18 states reported that lease hunting has somewhat decreased hunting opportunities, another 14 states reported no impact on hunting opportunity (White, 2001). Wiggers and Rootes (1987) reported that the availability of private land for hunting was highly variable across the US with 12 states showing increased availability, 23 states reporting to change in availability and four states reporting that the amount of land has decreased. However, White (2001) showed that overhunting on public land has not occurred in certain states such as California, New Mexico and other western US states where hunters often choose to pay for a private lease hunting experience instead of the neighboring public land due to perceptions of better quality of wildlife habitat and better hunting related services provided by private land. Ten years after the Wiggers and Roote (1987) survey discussed above Benson (2001) repeated the research. According to Benson from 1985 to 1995 access for hunting has decreased in 45% of the states, remained the same in 35% of the states and unknown change in 12% of the states. The area of land allocated to private land lease hunting in the US increased in 69.9% of the states, remained the same in 18.4% of the states and was unknown in 12.2% of the states. No states have reported a decline in lease hunting area. This study also found that in areas where lease hunting is practiced habitat management increased in 39% of the states, in 39% of the states there were no changes in habitat management and 22% of states the effect of lease hunting on wildlife management was unknown. At the same time within lands where lease hunting is not practised, habitat management went up, in 42% of the states there were no change and in 16% of the states the effect of lack of lease hunting is

unknown. According to Benson's (2001) survey, lease hunting did not achieve habitat improvement; however, it increased wildlife abundance. This finding is interesting and might be somewhat useful for predicting possible effects of lease hunting in Southern Saskatchewan.

3.3 Study Area

The Province of Saskatchewan has an area of 651,900 km^2 composed of boreal forests in the north and primarily agricultural land in the south containing approximately 44,329 farms on 26.02 million hectares (260,212km^2 or 64.3 million acres) of land (Statistics Canada, 2006). Total net farm income[9] in 2006 was $697.3 million (Statistics Canada, 2006).

Due to the availability of fertile soil and climatic restrictions, large scale, intensive agricultural production with current technology is economically feasible only in the central and southern parts of the province. In spite of the fact that almost half of the province's area is not suitable for intensive agricultural production, 44% of Canada's arable land is located in Saskatchewan (Government of Saskatchewan, 2010). The area of the province where private farmers engage in agricultural production is the area of interest of this research. Saskatchewan rural municipalities (RMs) are the primary administrative units that divide up the agricultural region of the province. RMs exclude cities, towns, villages, and Indian reserves from their boundaries (The Rural Municipality Act, 1989). In southern-central Saskatchewan there are 296 RMs that are organized in six Saskatchewan Association of Rural Municipalities (SARM) Divisions.[10]

[9] Net farm income is an important benchmark to compare the relative significance of the estimated value of recreational hunting leases in Southern-Central Saskatchewan.

[10] This area of the province is divided into several different levels of administrative unites such as Municipalities, Census Divisions, Regions, Wildlife Management Zones (WMZs), and into two Game Bird Districts (GBDs) these different levels of divisions, subdivisions, and regions are rarely overlapping as they serve different purposes.

Three study regions were pre-selected to be the focus of the present research to represent a diversity of agricultural regions within Saskatchewan, where the policy of introducing lease hunting could be considered. The three study regions are in different zones of the province from four different SARM divisions and have different characteristics relevant to the research such as landscape, agricultural products, and wildlife. The basic unit of selected areas are RMs shown in Figure 3.1 where the three selected survey areas are highlighted.

The three geographical target regions within central and southern Saskatchewan were identified as having abundant populations of wildlife game species. Two study areas were located in the west-central part of the province, one around the town of Eston and the second between the towns of Biggar and North Battleford, The third study area was in the east-central part of the province near the town of Esterhazy. The Biggar-North Battleford study includes nine RMs (Table 3.1) located in SARM Division 6, with the exception of RM346 which is located in SARM Division 5. During the rest of the thesis I will refer to the above-defined region as the Biggar area (Table 3.1, Statistics Canada, 2006). In total this area has a population of approximately 5,500 people and a total area of over 8,300 square kilometres or 830,000 hectares. The Biggar area is located in the South Game Bird District and in WMZ[11] 44, 45, and 47.

[11] About WMZs see Chapter 1.1.1. at page 4-5

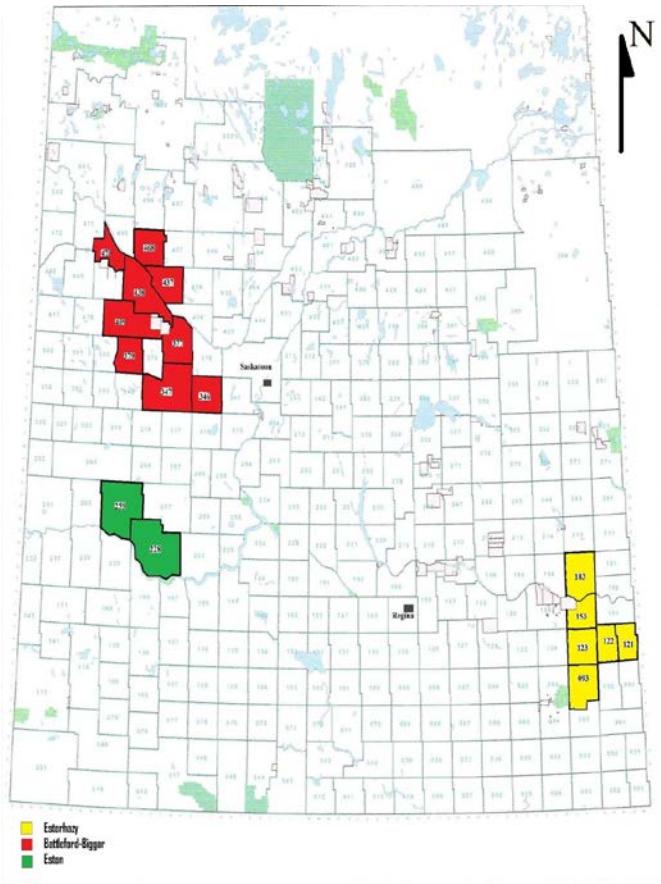

Figure 3.1: Saskatchewan Rural Municipalities making up the three study areas (Source: Author).

Table 3.1: Biggar area RM characteristics and population (Source: Statistics Canada, 2006)

RM	RM number	Population person/RM	Census Div	area (km^2)	SARM div
Perdue	346	432	12	826.14	5
Biggar	347	867	12	1597.87	6
Glenside	377	367	12	905.74	6
Reford	379	296	13	707.06	6
Buffalo	409	525	13	1222.08	6
North Battleford	437	737	16	797.2	6
Battle River	438	1053	12	1061.4	6
Meota	468	984	17	651.09	6
Paynton	470	254	17	593.95	6
Total		5515		8362.53	

The Esterhazy area includes six rural municipalities (Table 3.2) (Statistics Canada, 2006). This area contains approximately 2,700 people and a total of over 4,600 square km or 460,000 hectares area. The Esterhazy area is located in and around the Qu'Appelle Valley in the South Game Bird District and WMZ 33, 34, 35, 36 and 37. Just like in the Biggar area, white-tailed deer hunting is the main attraction. The map below (Figure 3-5) shows the high white-tailed deer densities areas (in red). Both the Biggar and Esterhazy areas are located in areas that are considered to have high densities of white-tailed.

The Eston area (Table 3.3; Statistics Canada, 2006) is located in SARM Division 3. This area contains a population of approximately 1,000 people on just under 3,500 square kilometres or 350,000 hectares of land. The Eston area, in contrast to the Biggar study area, has been important primarily for waterfowl hunting; particularly the Canada goose, snow goose, and mallard duck due to its proximity to the South Saskatchewan river. Eston is located on the South Game Bird District and in WMZ 24, 25, and 14.

Table 3.2: Esterhazy area RM characteristics and population (Source: Statistics Canada, 2006)

RM	RM numbers	population	Census Div	Area (km^2)	SARM div
Wawken	93	613	1	836.93	1
Moosomin	121	164	5	566.39	1
Martin	122	339	5	556.5	1
Silverwood	123	449	5	844.61	1
Willowdale	153	333	5	827.4	1
Fertile Belt	183	771	5	1006.68	1
Total		2669		4638.51	

Table 3.3: Eston area RM characteristics and population (Source: Statistics Canada, 2006)

RM	RM number	Population: Person/RM	Census Div	Area (km^2)	SARM div
Snipe Lake	259	427	8	1573.8	3
Lacadena	228	613	8	1890.08	3
Total		1040		3463.88	

The characteristics of the agricultural industry within the three study regions are important for understanding the development of hunting institutions. Table 3.4 provides a summary of the primary characteristics of the RMs in these three regions (Statistics Canada, 2006). The average farm size is largest in Eston at 730 hectares while this area has the smallest proportion of land that is cultivated at 54%. In the Esterhazy area the average farm size is the smallest with 470 hectares with 57% of the area being allocated to crop production. The Biggar area has an average farm size of 580 hectares, while it has the largest proportion of cultivated land (62%). Livestock agriculture is also a component of the landscape of the study areas. Average cattle numbers are as follows: Esterhazy at 117 head per farm, ranging to the Eston area,

Table 3.4: The Surveyed area's Agricultural information (Source: Statistics Canada, 2006)

RM	RM number	total cattle and calves in 2006	Number of farms	Total hectares of farms	land in crops hectares	total wheat	Winter wheat
Perdue	346	15,042	113	82328	61468	21707	X
Biggar	347	18,632	239	161145	79581	33458	100
Glenside	377	7,456	96	69276	30485	11623	X
Reford	379	4,353	116	64065	48869	20938	0
Buffalo	409	7,810	204	114338	90205	37738	0
North Battleford	437	6,460	196	82962	56025	21764	X
Battle River	438	10,633	241	117269	71321	26942	X
Meota	468	9,927	130	69503	44688	14965	X
Paynton	470	8,784	61	50867	15800	4086	0
Biggar Total		**89,097**	**1,396**	**811,753**	**498,442**	**193,221**	**100**
Snipe Lake	259	2,310	212	156472	98662	53022	X
Lacadena	228	16,126	259	189007	87821	50436	680
Eston Total		**18,436**	**471**	**345,479**	**186,483**	**103,458**	**680**
Wawken	93	22,798	127	63942	28483	6226	241
Moosomin	121	13,733	111	49553	30544	9672	X
Martin	122	22,175	107	55469	30294	6742	0
Silverwood	123	15,412	135	75280	40766	10242	611
Willowdale	153	9,215	115	46418	25384	5150	267
Fertile Belt	183	9,745	199	85072	57525	18375	X
Esterhazy Total		**93,078**	**794**	**375,734**	**212,996**	**56,407**	**1,119**

which has 39 cattle per farm (2006 census of agriculture[12]). The nature of agriculture, and in turn the allocation of land, is an important characteristic for the present study in that it might influence the perception of lease hunting among farmers. For example deer may be perceived as a competitor with cattle for forage resources. In areas of high white-tailed deer density browsing of vegetation could prevent cattle from accessing optimal nutrition, especially during the winter.

[12] http://www.statcan.gc.ca/pub/95-629-x/6/4124440-eng.htm#47

In this case farmers with both high density of deer and cattle might have a different perspective on hunting and hunting access as opposed to those farmers without cattle or in areas with low deer populations. Furthermore, a farmer might not want hunters on his land fearing the accidental killing of livestock. However, for livestock producers the opportunity cost of wildlife habitat might be relatively low since high-quality livestock range (bush, shrub, wetland) might also provide high quality wildlife habitat.

The allocation of land to annual cropping might also have a significant effect on farmers' attitudes towards the introduction of lease hunting. Typically harvesting operations for annual crops are completed when white-tailed deer hunting season starts, which is around the middle of November. As a result, deer hunters do not normally disturb agricultural production. However, in these cultivated areas there is often less land allocated to wildlife habitat due to the higher opportunity cost imposed by wildlife habitat. In the case of winter wheat however, farmers might not want to see hunters with all-terrain vehicles on their freshly seeded land, although within the three study areas, only the Esterhazy area has a significant extent of land seeded in winter wheat.

3.3.1 Wildlife and Hunting Profile of Study Areas

In the Biggar area there was an estimated winter white-tailed deer density of 1.09/ km^2 in 1980/81, which increased to 1.15/km^2 in 2001/2002 (Arsenault, 2003). In the Esterhazy area the winter density of white-tailed deer in the 1980/81 period was 1.24/ square km and during the 2001/2002 winter the density had decreased to 0.95/ km^2; with a winter population of 59,508 and 45,857 in 1980/81 and 2001/2002 respectively (Arsenault, 2003). Overall, the white-tailed deer density was only classified as medium at the Easton area, while densities were considered high in both at the Esterhazy and at the Biggar area (Figure 3.5). Overall,

provincial populations of white-tailed deer in the year 2007 were estimated at 350,000, mule deer: 44,000, elk: 15,000 and moose: 50,000 (Saskatchewan Ministry of Environment, 2007); however, density is highly variable throughout the province.

The populations of game species in the province of Saskatchewan has resulted in significant demand for hunting opportunities. Hunting in Saskatchewan is also an important contributor to the Saskatchewan economy (Murray, 2006). According to the Ministry of Environment 2006 report there were 64,000 hunters in Saskatchewan and among those 42,000 were actively hunting during the 2004 season (Murray, 2006). In addition, this document reported that in 2006, resident hunting trips outnumbered out-of province hunting trips 40 to 1. Therefore, Canadian and foreign hunting in Saskatchewan is significant, but historical patterns indicate that their numbers are small compared to local hunting activity. Dierker and Gray (1998) concluded that by allowing the sales of white-tailed licenses to non-resident hunters, especially in years when white-tailed deer population (Figure 3.2) is very high, significant economic gains can be realized.

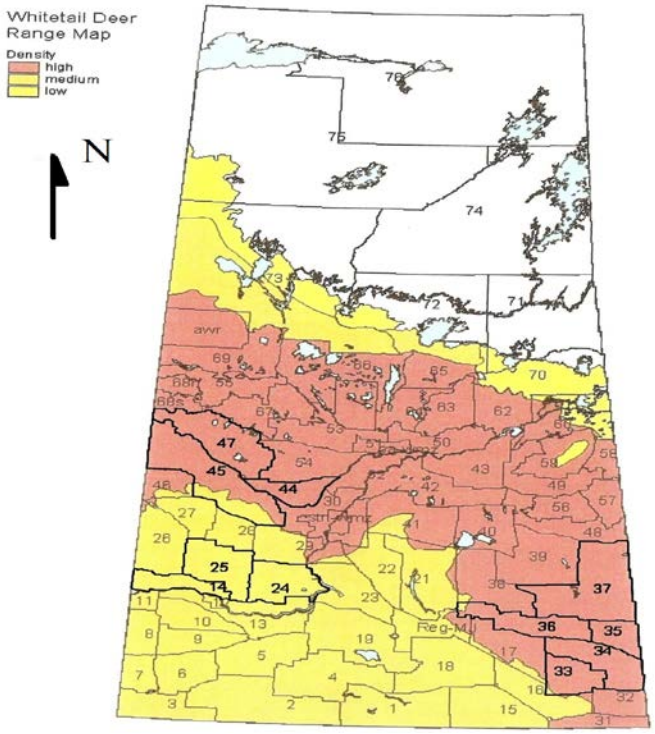

Figure 3.2: White-tailed deer[13] density in Saskatchewan (Source: Arsenault, 2003)

The Boone and Crockett Club[14] (B&C) is the record keeper for North-American big game records. For white-tailed deer there are certain criteria that an antler has to satisfy to be considered a record. Milo Hanson, from Biggar, SK is the current world record holder in the Typical White-tail Deer category with a total score of 213 5/8 for a deer shot in the Biggar area in 1993. Ever since the world record Hanson buck, demand for hunting among foreign hunters increased in Saskatchewan (Figure 3.3) and among Canadian hunters (Figure 3.4), however

[13] It is worth noting that white-tailed deer is not a native species to Southern Saskatchewan as white-tailed deer is a woodland animal that is not a natural prairie habitant. Its abundance is closely related to the expansion of agricultural production. Ample grain and seed increase the chances of wildlife to survive harsh winters. Emigration from rural area to urban area also results in less human interference with wildlife (Geist, 1998).

[14] B&C measures the number of points in each antler, the tip to tip spread, the inside spread of main beams, the total length of all abnormal points, length of main beam, length of normal points, and the circumferences (Hanson buck, 2003). For each criteria there is a scoring formula and whichever antler has the all time highest score is the world record.

steadily decreased among local hunters (Figure 3.5). The above trends are based on license sales tracked from 1993 to 1994 (Arsenault, 2003). The most significant increase was among non-resident hunters with a 49% increase in demand during the last 30 years (Figure 3.3). More importantly Arsenault (2003) reported that foreign hunters spend a significant amount of money when they visit Saskatchewan and therefore contribute to the local and provincial economy. Other big game species such as mule deer, elk, and in recent years pronghorn antelope, and even moose have also shown to be important draws to the area for recreational hunters.

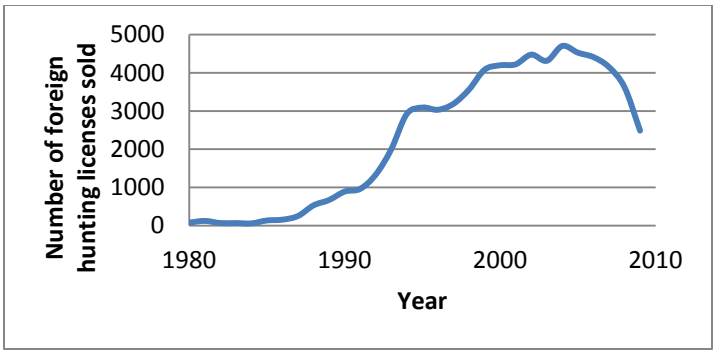

Figure 3.3: Either sex white-tailed deer license sold to foreign hunters from 1980 - 2009[15] in SK (Source: Arsenault, 2003).

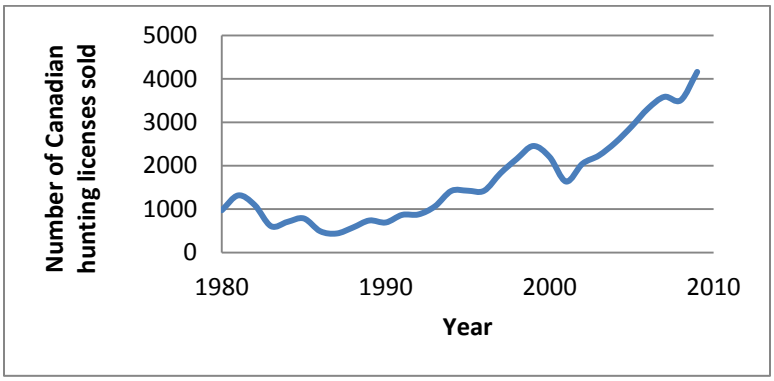

Figure 3.4: Either sex white-tailed deer license sold to Canadian hunters 1980 - 2009 in SK (Source: Arsenault, 2003).

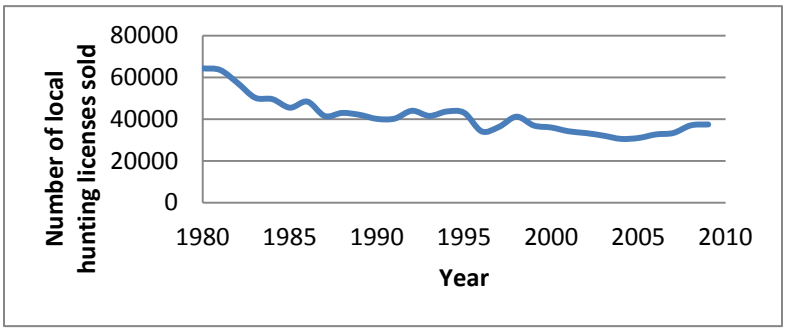

Figure 3.5: Either sex white-tailed deer license sold to local hunters 1980 - 2009 in SK (Source: Arsenault, 2003).

[15] The data for Figure3.2 to 3.3 are raw data numbers from the Saskatchewan Ministry of Environment

3.4 Survey of Saskatchewan Hunting Stakeholders

In order for lease-hunting policy to be introduced the government must first understand the attitudes of stakeholders in southern Saskatchewan towards lease hunting and the characteristics that might make lease hunting an attractive option. The assumed stakeholders for this study are farmers and outfitters. Farmers' attitudes are crucial as they would be the primary beneficiaries of a policy change; however, if farmers are not supportive of lease hunting, then policy makers might have to consider other policy mechanisms to address wildlife management concerns. On the other hand if farmers are supportive of a lease hunting proposal it would also be valuable information for policymakers. Under the current hunting legislation the revenue from a lease hunting operation would come largely from the Saskatchewan resident and Canadian resident hunters, as non-resident hunters are only allowed to hunt in the northern WMZs where most of the land is Crown land. However, if non-resident hunters were allowed to hunt in the southern WMZs for big game, demand for lease hunting would also come from non-resident hunters. In the province, waterfowl and upland game bird hunting is allowed for foreign hunters in the Southern bird district. In order to develop an understanding of farmer attitudes towards lease hunting a survey was developed to gather these attitudes from a sample population of farmers from each of the three identified study areas.

3.4.1 Survey Administration as Data Collection

For the survey of Saskatchewan farmers, several approaches were considered including web-based, mail-out, telephone, and in-person surveys; all having advantages and disadvantages (Champ, 2003). While web-based surveys are low cost, lack interviewer bias and offer immediate data analysis, they have serious disadvantages. It is not possible to

generate representative samples due to strong non-response bias; stakeholder bias, where only those who have strong preferences respond; and identity issues (Duda and Nobile, 2010). In addition, residents of rural areas of Saskatchewan do not always have consistent or reliable access to the Internet making it difficult to solicit a representative sample.

The advantage of mail surveys is the relative low cost, and lack of interviewer bias (Champ, 2003). Additionally, it is possible to use visual aids, and there is no time constraint on the interviewee. Notwithstanding, mail surveys often have very low response rates (Champ, 2003). In similar studies (Conacher, 1997; Hussain, et al. 2005) mail surveys were used with response rates of 40 and 25 per cent respectively. The other costs of conducting mail surveys are related to increased error rates since the interviewees have the option to read through the survey and decide afterward to respond, producing a self-selection bias that would make it possible that non-respondents would differ statistically from respondents.

Telephone surveys were also considered although they have strong social desirability bias. However, it is difficult to get a representative sample as many telephone owners are not listed and using random digit dialling seemed difficult with only a small proportion of Saskatchewan residents being active farmers. More importantly, telephone surveys have low response rates (Champ, 2003).

For this study the in-person survey approach was chosen due to the case study nature of the project. It seemed appropriate due to the geographically identifiable wildlife density differentials and due to limited resources to user fewer sources and focus on depth by collecting data from focused geographical regions. An important benefit of in-person interviews for this study is to have an opportunity to follow up on open-ended questions. The negative side of the in-person data collection is the interviewer effect where respondents are more likely to provide

socially acceptable answers in front of an interviewer. Furthermore, interviewer heterogeneity might generate biased answers. To counteract the heterogeneity bias one interviewer conducted all the interviews and presented the questionnaire in a uniform way, following the same pattern of questioning. In addition to quantitative we also acquired qualitative information regarding sentiments and attitudes toward lease hunting.

The survey was conducted in two stages: in the first stage the specific study areas were selected based on the historical hunting activity and wildlife resources of the areas and in the second stage farmers in each study area were randomly selected for in-person surveys. The interviewer visited each RM of each study area and with the help of RM landowner maps identified the farmers of the area. The interviewer contacted farmers after randomly[16] selecting subjects from the preselected study area RMs.

The farmers selected for interviews were Saskatchewan farmers owning more than 65 hectares (160 acres or one quarter section) of land. This was the amount of land that early homesteaders received, according to the Dominion Act (1872), to populated Western Canada.

3.5 The Survey Instrument

3.5.1 Farmer Survey

The structure of the survey was informed by similar studies conducted in the US examining the characteristics of fee access hunting (Adams et al., 2000; Baen, 1997; Henderson and Moor, 2006; Hussain, 2005 and White et al., 2000). In particular, the survey developed by Hussain (2005) was relevant to the research objectives of the present study as Hussain's survey examined the factors determining lease revenues for US farmers where lease hunting is

[16] Random selection of subjects: the interviewer randomly chose a route and attempted to contact every farm along the route.

practiced. Hussain's survey provided a tool that I was able to adapt to the specific circumstances and conditions of Saskatchewan's legal, historical, and social environment. The survey instrument addressed two primary questions related to recreational lease hunting in Saskatchewan. First this study examined the attitudes and perceptions of stakeholders on changing rules of recreational leases and second it examined the heterogeneity in stakeholders' perceptions. The survey asked farmers about their willingness to participate in a recreational lease scenario as well as identifying attributes about recreational leases that are considered important by the surveyed participants.

In the spring of 2009 pilot surveys were conducted with seven members from the University of Saskatchewan Bioresource Policy, Business and Economics Department, who were farmers themselves from the south and central part of Saskatchewan. From the feedback received during this pilot process the surveys were modified accordingly.

The survey instrument was a questionnaire (Appendix 1) administered as an in-person survey. Before the survey started two screening/filtering questions were asked to confirm that the interview subject was really a farmer and a farmer in South-Central Saskatchewan who owns more than 65 hectares (160 acres, or one quarter section) of land. The survey contained 11 main questions that were divided into sub questions aimed at eliciting more detailed information specific to the respondent. Depending on the answers given by the subject, the order of the questions was adjusted and some of the questions were omitted to ensure that the questions were relevant for each of the subjects (Figure 3.6). The survey questions were divided into five sections.

In the first section (Q1-Q1a) farmers were asked about the perceived quality and quantity of the wildlife[17] and wildlife habitat on their land using a rating scale from 0 to 9, where 0 was defined to represent non-existence of wildlife habitat and nine represented a situation where the wildlife or wildlife habitat could not be any richer. This information was crucial in determining the quality, quantity, and the perception of wildlife on the farmers' land from the farmers' point of view. Following the wildlife-related questions the second section focused on attitudes and perceptions toward hunting and toward hunters.

In the second section (Q2-Q2a) farmers were asked how they behaved towards hunters during the 2008 hunting season (Q2-Q7). For example: Q2a) Did they post their land with "*No hunting*", "*Hunting on foot only*" or "*Hunting with permission only*" signs? Q4 queries whether there is any interest from the hunting population ("*Did you allow hunting on your farmland during the 2008 fall hunting season?*"). Figure 3.6 illustrates the sequence and logic of the survey. Q7 asked about farmers' attitudes to hunting and hunters, and was followed by contingency questions. For example, if the respondent answered no to Q7 ("*Have you ever allowed hunting on your land?*") then the follow-up question investigated the reason respondent do not allow hunting. In the event the respondent indicated that they are ethically against hunting, a scale of 1 to 10 prompted, where 10 indicated strong agreement with the statement "*I am ethically against hunting and do not support any kind of hunting*". In this sequence the survey then channels the respondent to the demographic questions, if the respondent reported a strong ethical opposition to hunting as revealed by a response of 8, 9 or10 for the above question. In this case the respondent was not asked questions about attitudes in sections 3 and 5 and the survey ends there. In the event the respondent did not allow hunting on her land for other than

[17] i.e. wildlife life in general and specific species such as white-tailed deer and mule deer

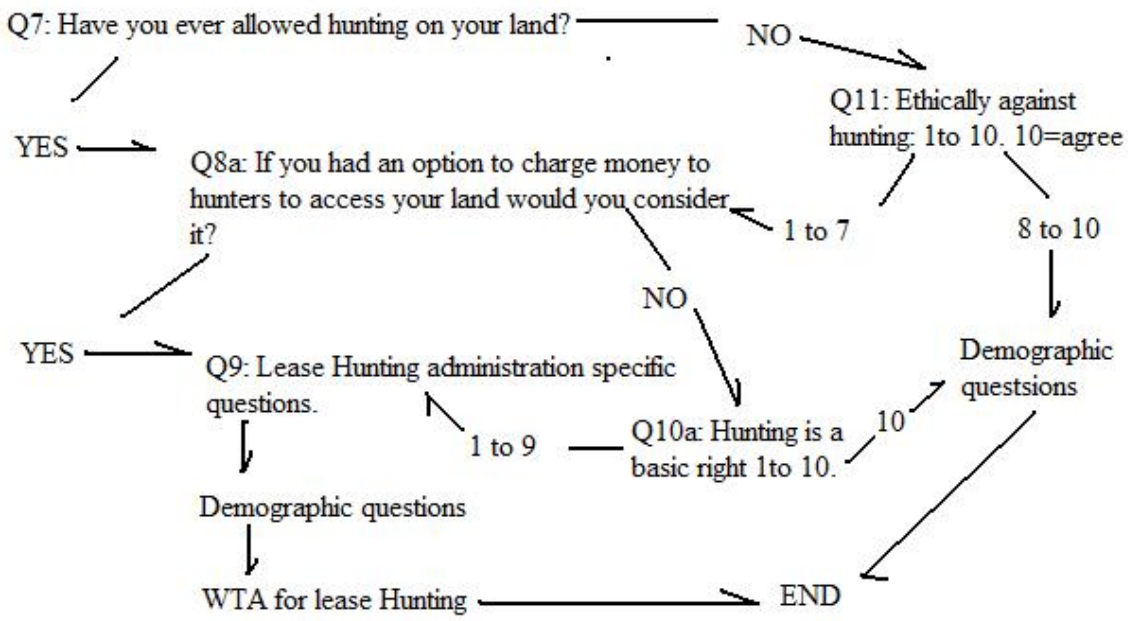

Figure 3.6: Flowchart of the survey (Source: Author)

ethical reasons the respondent was channeled to the main branch of the survey where the respondents who answered "Yes" to the "*Have you ever allowed hunting on your land?*" where the main decision maker question is asked.

Q8a was a key question used to separate farmers into two groups – "*If you had an option to charge money to hunters to access your land would you consider it*?" – those who support lease hunting and those who failed to support lease hunting. Respondents who answered no to the question were further divided into two groups based on beliefs about hunting as a basic right Those who strongly agreed and answered 10 on a scale of 1 to 10 were channeled to the

demographic section[18], leaving out section 3 and section 5, thus ending the survey. In contrast, those who expressed less significant agreement with the above statement, based on a response of 1 to 9, were channeled with the support lease hunting group and asked attitudinal questions in related to lease hunting. The reason behind this approach is that the group who strongly disagree with the statement "*Hunting is a basic right*", they would presumably be more likely to accept the idea to charge money for hunting access. Non-support of lease hunting is probably coming from reasons other than strong ethical considerations against hunting in exchange for money. On the other end of the spectrum those who absolutely agree, by choosing 10 on the scale, would not be asked questions about lease hunting as they are clearly against the idea.

The Saskatchewan Wildlife Federation (SWF), which represents many of the recreational hunters in the province, has stated that it adamantly opposes lease hunting based on the belief that hunting in SK is a right granted to Saskatchewan residents in 1930 by the Natural Resource Transfer Agreement. The SWF believes that introducing lease hunting would decrease hunting opportunities for SK hunters, further decreasing the popularity of recreational hunting among Saskatchewan residents (Crabbe,[19] 2013).

Section 3 (Q9-Q9j) asked the farmer to rate statements related to the administration of a hypothetical hunting lease on a scale of 1 to 10. Information on farmers' perception of lease hunting and their valuation of the lease market was obtained by asking questions in two different steps. In the first stage the focus was to collect information about whether the farmers would be willing to participate in providing access for hunters in exchange for a lease payment. In the second stage, questions focused on collecting WTA responses. After the lease hunting related attribute question, respondents were asked demographic questions and

[18] The aim of this question to filter out the most opiniated landowners who think lease hunting should not be ever considered as it is a basic right.
[19] Telephone interview with Mr. Darrell Crabbe the executive director of SWF on 22/Feb/2013

finally in section 5 they were asked questions developed to estimate the magnitude of payments required to allow hunter access using a willingness to accept (WTA) process. The hypothetical access fee would be paid by outfitters and hunters, especially Canadian and foreign hunters, to rural Saskatchewan farmers. These might not have been easy questions to answer since respondents likely had little to no experience with this type of exchange since there is no precedent of such institutions in Canada and it is illegal to collect a fee for hunting access (Bill-60, 1998). Therefore the respondents were assured that the answers would be treated in a highly confidential manner (Appendix 2) and also that the questions are dealing with strictly hypothetical scenarios and not about current practices. Collecting the WTA information was also a valuable tool to estimate the value of recreational leases for the overall Saskatchewan economy, enabling policymakers and voters to have a better understanding of the significance of the issue.

3.5.2 Outfitter Interviews

To provide quantitative and qualitative information on the demand for hunting in Saskatchewan, hunting outfitters in the province were surveyed. I expected them to be knowledgeable in general about the hunting industry and especially about the demand for hunting by non-resident hunters and could thereby give reasonable insights into the consequences of introducing hunting access leases. In addition, the outfitters represented a group of potentially important stakeholders as hunting leases could be required for their operations. In this study outfitters were assumed to represent hunters, and in particular non-resident hunters, that may be interested in purchasing recreational hunting leases in southern and central Saskatchewan from private farmers.

The outfitter interviews were aimed at increasing the understanding of outfitting operations and providing insights to help quantify and/or qualify the current demand for hunting services and the perceived value of recreational leases in Saskatchewan. The telephone interview guide was developed after the farmer survey was completed. The logic of the telephone guide was similar to that of the farmer survey. The objectives of the questions were to understand how outfitters reacted to the idea of lease hunting and how lease hunting would affect outfitting operations. Appendix 3 contains the outfitter interview guide. The interview guide contains 11 questions that focused on understanding the nature and make-up of the outfitting firm including location, type of clientele and whether outfitters deal with farmers as part of outfitter operations.

The first question in the outfitter telephone interview functioned as a filter to confirm that the outfitter focused on white-tailed deer hunting. The second question was multiple choice regarding the origin of the clientele. The options were: Canada (Saskatchewan), Canada (other provinces), the US, Europe, and other. The next question divided outfitters into those who had to deal with private farmers and to those who do not. Those outfitters who answered yes to the third question were then asked a series of three questions focused on understanding the relationship between farmers and outfitters such as the length of their co-operation, and the nature of their relationship including what kind of services farmers provide. Question five explicitly asked what kind of compensation farmers receive from the outfitter in exchange for hunting land access. This was an open ended question to gauge the presence of legal or semi-legal lease hunting. As a follow-up question the respondents were asked whether they were ever refused access to private land in order to estimate the lost revenues due to a lack of market mechanism.

The next series of questions (7 through 11) focused the opinion of the outfitter towards a hypothetical lease hunting scenario, which asked whether they would participate, and more

importantly, if the introduction of lease hunting would be a good idea. Question eight focused on estimating the outfitter's WTP for hunting land access in an open ended question to complement the hypothetical market that was created using producers (farmers). Question 10 evaluated the causes that led to the rejection of the idea of lease hunting. Question11 was multiple choice to determine administration preferences in the event that lease hunting were introduced.

3.6 Data Collection

3.6.1 Farmer survey

The survey was conducted between April 1, 2009 and April 27, 2009. The subjects of the survey were largely crop farmers, who were generally unavailable after spring seeding. Ranchers were also busy during the calving season from January to March, making the timeframe for data collection narrow. The other limiting factor was the weather conditions as travelling alone in unknown rural areas in extremely low temperature (in a typical Saskatchewan winter) could be hazardous. As a result the month of April was deemed to be the most appropriate time to complete the survey.

A typical interview was completed in approximately fifteen minutes with the researcher asking the questions and filling out the form based on the responses received. The interview generally occurred on the respondent's property in the afternoon hours in a very relaxed manner. Interviewees were very friendly and helpful and often added background information related to the questions. The additional information voluntarily provided by the subjects helped to enrich the context provided in the body of the survey and contributed to a deeper understanding of the connections among different interest groups.

The interview process gave me important insight into the broader attitudes and life of farmers in rural Saskatchewan which was very helpful being someone from Hungary

Budapest with a very urban upbringing. The majority of famers were very friendly and open minded a few of them even invited me for dinner more importantly they gave me lot of qualitative data which I unfortunately was not prepared to fully absorb and use in the present paper.. I would highly recommend to other students from the Department[20] to participate in primary data collection through farmer interviews.

3.6.2 Outfitter survey

Telephone interviews were conducted with ten members of the Saskatchewan Outfitters Association (SOA). The SOA website lists 54 regular members of the association that specialize in white-tailed deer hunting for which hunting camps were approachable via road (SOA, 2009). Having a road access preselecting criteria seemed relevant as southern Saskatchewan farms are easily accessible by road and including only airplane accessible areas would have distorted the responses. The interviews took place between May 29 and June 15, 2009.

3.7 Econometrics for data analysis

The econometric analysis was developed to explain perceptions of the different stakeholders – farmers and outfitters – to the introduction of hypothetical recreational hunting leases. Furthermore the analysis was used to evaluate the impact of farmer characteristics on their attitudes toward recreational hunting leases. Also, an objective of this research was to provide a crude estimate of the value of recreational hunting leases at the aggregate, provincial economy, level.

For the data analysis I used three different approaches to extract relevant information from the farmer survey data: descriptive statistics, WTA regression, and qualitative response (QR) analysis. As a preliminary step I compared and contrasted the statistical characteristics of

[20] University of Saskatchewan Bioresource Policy, Business and Economics Department.

survey data to the 2006 agricultural census data and to the 2006 Province of Saskatchewan census data to determine whether the sample was representative of the provincial population. The comparable variables were age, education, size of farm, and the size of additional rented land for agricultural production. I used the statistical software Stata11.2 for analyzing the data.

By analysing descriptive statistics several important questions can be addressed concerning lease hunting in southern and central Saskatchewan. Depending on their responses, farmers received different questions that are more relevant to their situation. From the information I was able to rank the importance of different elements of lease hunting contracts.

The analysis of the WTA questions provide a preliminary estimate of the value of recreational hunting leases for farmers and possibly, even more importantly, what would be the value of recreational hunting leases for the whole Saskatchewan economy if the policy were to be implemented. Valuable information was extracted from the survey data using WTA regression analysis. In the analysis I examined how WTA is affected by selected farm characteristics such as land area, rented land area, attitude toward hunters, age, and education. I used a tobit regression to inform the above-stated questions, as the tobit model allows the existence of a latent negative variable. It is necessary to assume the unobserved negative WTA as certain landowners might even pay for hunters to kill the nuisance wildlife on their land hence resulting in negative WTA, which would not be revealed by the survey data. To address the question of how Saskatchewan farmers perceive hunting leases – whether they are supportive of the idea to introduce hunting leases or not – I estimated correlations between attitudes, the farmers perception of wildlife populations, demographic characteristics and attitudes toward introducing hunting leases.

One of the most important variables informing attitude toward lease hunting is whether Saskatchewan farmers would be supportive of introducing recreational hunting leases on their private land. For this task I used a discrete choice model as farmers had two mutually exclusive choices: *support*, or *failed to support lease hunting*. Values of 1 and 0 were assigned to the responses to the question "*If you had an option to charge money to hunters to access your land for hunting would you consider it?*". If the response was "*support the introduction for lease hunting*", 1 was assigned; if the response was "*failed to support the introduction*", 0 was assigned.

Certain farmer characteristics might influence the decision of whether to support, or fail to support, the proposed lease hunting scenario. Therefore, to determine how certain characteristics affect the attitudes towards hunting leases, a regression approach was selected. To determine the best estimate possible I used different estimation methods. First, to gain a robust picture, a linear probability model was used: X' is a data matrix of observations from relevant factors gained through the surveyed farmers representing the farmer characteristics, attitudes, and demographic data that might influence farmer decision and β is a vector of parameters that reflects the impacts of changes in X' on the probability outcome. Since it is a probability model the dependent variable Y has to be restricted to the 0 to 1 closed interval. The *probit* model was chosen to explain the probability. The *probit* model is the most commonly used application (Greene, 2008; Train, 2009) and is derived from a bell shaped symmetrical distribution, i.e. the normal distribution. Qualitative Response (QR) in this context is to find 'stakeholder' characteristics that explain why they support or failed to support the introduction of lease hunting in southern and central Saskatchewan.

The following theoretical model was incorporated to represent the decision-making process of farmers. The farmer decision maker faces two alternatives. After choosing one of the two alternatives, she derives a certain degree of utility. The probability that event *j (support or failed to support)* occurs has the same chance than as the dependent variable Y and will take on the value *j,* which is determined by a function of (X) and parameters β.

$$\text{Prob(event } j \text{ occurs)} = \text{Prob}(Y=j) = F[x] \qquad (3.1)$$

In my model the farmer either supports the introduction of lease hunting (Y=1) or rejects the idea (Y=0). I assume that the set of relevant factors that will determine this attitude includes demographic variables, agricultural production related variables, attitude toward hunting, previous experience with hunters, wildlife abundance on his or her farm. These factors are represented in vector X, and explains the decision such that:

$$Prob(Y = 1|x) = F[x, \beta] \quad (3.2)$$

$$Prob(Y = 0|x) = F[x, \beta] \quad (3.3)$$

The restriction on Y, that it is between 0 and 1([0;1]), requires that[21]

$$\lim_{x'\beta \to +\infty} Prob(Y = 1|x) = 1 \quad (3.4)$$

$$\lim_{x'\beta \to -\infty} Prob(Y = 1|x) = 0 \quad (3.5)$$

3.8 Conclusion

This chapter provides a description of the study areas of this research, describes the survey instrument and the methods used to deliver the survey. The purpose of this survey was to gauge the attitude of different stakeholders with respect to introducing recreational hunting leases on Southern and Central Saskatchewan private farm lands. Farmers and outfitters either support or reject the idea of lease hunting. Both groups have reasons for their opinions and the goal of this thesis is to shed some light on those reasons. I suspect that certain demographic and attitudinal characteristics that are specific to one group of farmers make it more likely for them to support the introduction of hunting leases.

[21]Equation 4 and 5 are from Greene, 2008: Equations (23-5) on page 773.

Chapter Four

Results and Discussion

4.1 Introduction

This chapter presents findings of the data analysis. First, I evaluate whether the sample population is representative of the provincial farming population. Next, analysis of the descriptive statistic provides insights of the attitudes of Saskatchewan farmers. Finally the econometric analysis identifies factors that influence the theoretical price of recreational hunting leases. Moreover the analysis identifies farmer attributes, characteristics, and perception that affect their attitudes towards the introduction of lease access hunting.

4.2 Survey response and univariate descriptive statistics of variables

The survey response rate was very high; from the 96 contacted farmers 89 surveys were collected (93% response rate). Five surveys were discarded due to technical and administrative reasons resulting in an 87.5% valid response rate. There were 19 usable surveys completed in the Biggar-, 15 from the Eston-, and 50 from the Esterhazy areas.

To assess whether the sample population is representative of the general farmer population of Saskatchewan, the demographic characteristics of the sample were compared with Saskatchewan's farmer population. It appears that the sample population of the study is consistent with the provincial farmer population in terms of age and farm size when compared to the 2006 Census of Agriculture. The age distribution of the surveyed farmers in the study sample was consistent with the Saskatchewan farmer's population reported in the Census of Agriculture (Statistics Canada, 2006) (Table 4.1), assuming a uniform distribution within a sample age

group[22] (Appendix 4.1). There is no statistically significant difference in age distribution between the sample and the 2006 agricultural census data (Appendix 4.2). According to the 2006 agriculture census the size of the average Saskatchewan farm is 587 hectares (1450 acres) which is not significantly (Appendix 4.3) different from the average farm size of the sample of 629 hectares. The distribution of the highest education level of the sample population shows that the sample has a higher overall level of education than the general non-farmer Saskatchewan population. The differences are strongest at the 'high school diploma' and at the 'minimum bachelor degree level'. At the high school level the general farmer Saskatchewan population (30%) outnumbers the sample (Appendix 4.4) (21%); however, the sample population has a higher level of education (24%) than the general population (16%): both of these findings are significant at the 10% level (Appendix 4.5). For other education levels there are no statistically significant differences from the general Saskatchewan population. Based on these comparisons I have confidence that the sample populations are representative of the provincial farm population enabling extrapolation of the study results with some level of confidence.

[22] Originally in the survey farmers had four age groups to choose from: under 35 (n=9; 10.7%), between 35 and 50 (n=29; 34.5%), between 50 and 65 (n=30; 35.7%), and over 65 (n=16; 19%).

Table 4.1: Comparison of Saskatchewan's Farmer Population and survey sample

	Survey	**Census of Agriculture**
Age (%)		
Under 35 years	10.7	10.1
35 to 55 years	46.0	47.9
Over 55 years	42.9	42.1
Farm Size (ha)		
Owned land	629.1[1]	587
Rented land	163.3[2]	n/a
	Survey	**General Census**
Education (%)		
Less than grade 12	19.0	20.5
High school diploma	21.4	29.6
Some University or College	35.7	34.1
Bachelor degree	23.8	15.9

[1] Census of agriculture has no lower limit for the size of the land owned, even hobby farms are included, which explains the owned land size differences between the survey: 629.1 hectares and the census of agriculture: 587 hectares.
[2] Min=0ha and max=1812.99ha.
(Source: Statistics Canada, 2006; Authors calculations)

4.3 Attitudes towards recreational lease hunting and multivariate analysis

The survey questions allowed the respondent to indicate that they supported, were uncertain or were against the introduction of a proposed lease hunting approach. However it was determined that the analysis would be simplified by having only two responses. As a result, the *uncertain* and a*gainst* answers were combined to form the category of f*ailed to support.* Overall, the respondents voted 48.81% to s*upport* and 51.19% f*ailed to support.* This step assumes that those farmers who responded to the referendum as *uncertain* or *against* were not supporting the introduction of lease hunting at the time of the survey. It is interesting to note that the attitudes were similar across the three surveyed areas (Table 4.2). That is the study population farmers have a similar attitude distribution towards the introduction of lease hunting, regardless of where they are located.

Table 4.2: Geographical location and attitude toward lease hunting (Source: Author's Calculations)

Area Surveyed	Support %	Failed to Support %	Total %
Esterhazy	48% (24)	52% (26)	100% (50)
Eston	46.7% (7)	53.33% (8)	100% (15)
Biggar	52.63% (10)	47.37% (9)	100% (19)

4.3.1 Relationship between age and attitude to lease hunting

Among the four age groups (under 35, between 35 and 50, between 50 and 65, and over 65), none are significantly different from the null hypothesis that farmers are equally likely to support or fail to support lease hunting. For example, even the over 65 age group, where there was the lowest support with 38% supporting lease hunting and 62% fail to support, the difference is only significant at the11% level. The second most opinionated group was the 35 to 50 years age group, where 59% supported lease hunting and 41% opposed it. The other two age groups were fairly evenly split, at approximately 50% each. When examining the in between group the null hypothesis that the mean is 50% the binomial probability test however failed to reject at any standard significance level.

Even though the results are not significant at any standard significance level, there is an 89% chance that the attitude to the lease hunting proposal with respect to the oldest farmers is not due strictly to chance. It is possible that older farmers grew up in a system where asking money from your neighbour for hunting was not done. Hunting in general, and the right to free hunting in particular, is part of a traditional value system and therefore changing the status quo creates tension against the change. Even in the USA, where lease hunting exists as a legal option,

only 5% of agricultural producers sell hunting leases (Conover, 1998). In certain regions one of the stated reasons that farmers[23] did not sell hunting leases was because it is considered socially unacceptable (Hussain, 2005) by the community, which might explain why older farmers are more reluctant to require payment for hunting leases. In that sense the non-supportive attitude of older farmers toward lease hunting is consistent with what has been found in related studies (Wright et al., 1988). It is interesting to note that only in the 35 to 50 year age group was the majority (Appendix 4.6) of farmers in favour of lease hunting (Figure 4.1). Several personal statements during the survey process from this age group expressed the attitude that lease hunting is considered a viable business venture and in some of the cases the surveyed farmers were very supportive of and eager for the introduction of lease hunting.

[23] Hussain (2005) listed four other reasons: 1/ opportunity cost too high;2/ concern for personal safety , privacy, liability concerns, damage to crop and property; 3/ Not having enough knowledge about running a hunting lease venture; 4/ socio-demographic characteristics: location, race, gender, education, personal bad experience with hunters, moral reasons against hunting

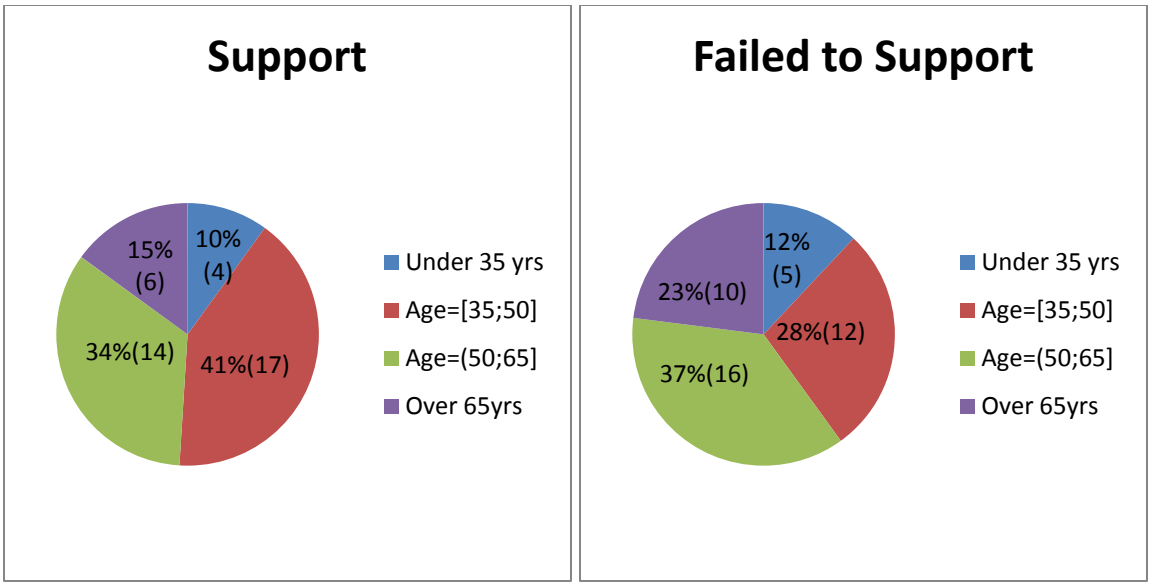

Figure 4.1: Age composition by support categorization of surveyed farmers[24] (Source: Author's Calculations)

4.3.2 Relationship between education and attitude to lease hunting

Within the surveyed population the attitudes toward lease hunting did vary somewhat by education level (Figure 4.2). Farmers with high school or some post-secondary education were evenly split on their attitudes toward introducing lease hunting. However, a slight majority of farmers with less than grade twelve education were not supportive of lease hunting (56.25%), while 60% of farmers with at least a college degree, favoured the introduction of lease hunting (Figure 4.2).

[24] Looking from another angle, in the survey sample 35% of farmers are in the age group 35 to 50 years, while among farmers who support the introduction of lease hunting the same age group (35 to 50 years) represents a share of 41%. This means that among the supporters the 35 to 50 years age group is overrepresented when compared to the general farmer population of Saskatchewan. On the failed to support side the 35 to 50 years age group is underrepresented with a 26% share as opposed in the general Saskatchewan farmer population of 41% share. Similarly the over 65 years age group represents 19% of the general Saskatchewan farmers while at the fail to support group they are overrepresented with 24% share and at the supporting of the introduction lease hunting side the oldest age group is underrepresented with 15% share. In the youngest age group, those under 35, the majority of respondents were against fee hunting, although this result was not statistically significant, since this age group included only 9 farmers in the sample, the actual frequency of responses showed four supporters and five in opposition to a fee hunting regime. As a result, it would be difficult to infer any trends in attitudes of the younger age group towards lease hunting based on the survey data.

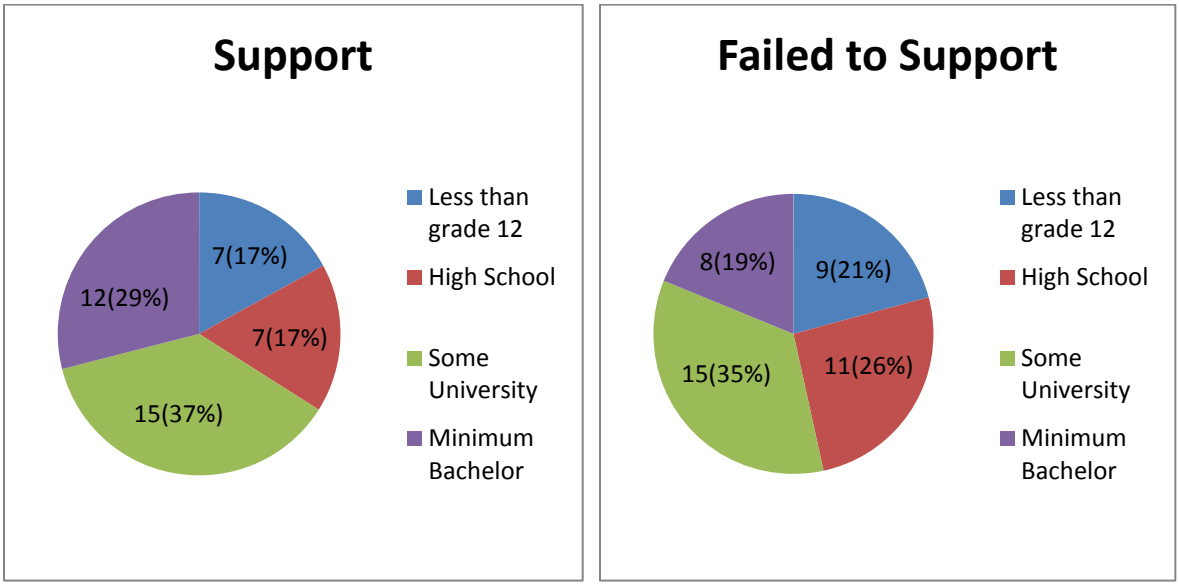

Figure 4.2: Support of lease hunting by highest level of education (Source: Author's Calculations)

However, just like in the case with age none of these results were significant at any level to reject the null hypothesis that support of lease hunting does not differ with education.

4.3.3 Relationship between land tenure and attitude to lease hunting

Within the sample population farm size seems to have an effect on the attitude of respondents toward lease hunting. In general those who were in support of the lease hunting option owned and managed larger parcels of land compared to those who were not in support of lease hunting (Figure 4.3). For example, farmers who favoured lease hunting owned, on average 707 hectares (1746.83 acres or approximately 11 quarter sections) of land and rented an additional 273 hectares (674 acres or 4.2 quarter sections) of land. In contrast those farmers who failed to support the introduction of lease hunting owned, on average 554 hectares (1400 acres)

and rented significantly less land (59 hectares or 150 acres) (Figure 4.3). The positive relationship between larger land size and support of lease hunting ties in with the Wright et al. (1988) study in east Texas, which found that farmers who participated in lease hunting owned more land (154 hectares average) than those who did not participate in lease hunting (owned 61 hectares average). In my data the correlation between the size of the rented land and the support of fee hunting is statistically significant at 1% (Appendix 4.7). It can be stated that those who failed to support lease hunting owned smaller areas of land, while farmers who rented land over and above what they owned were more willing to support the introduction of lease hunting.

The survey also revealed that farmers who rented larger quantities of land were more likely to support lease hunting (Figure 4.3 and 4.4). The first striking observation is that of those who supported lease hunting, 39% rented additional land for agricultural production while only 26% of those who failed to support the initiative rented land. In addition, there is a strong positive relationship between the quantity of land rented and support for lease hunting. All of the ten respondents who rented at least 518 hectares (1280 acres) land for agricultural production supported the introduction of recreational lease hunting.

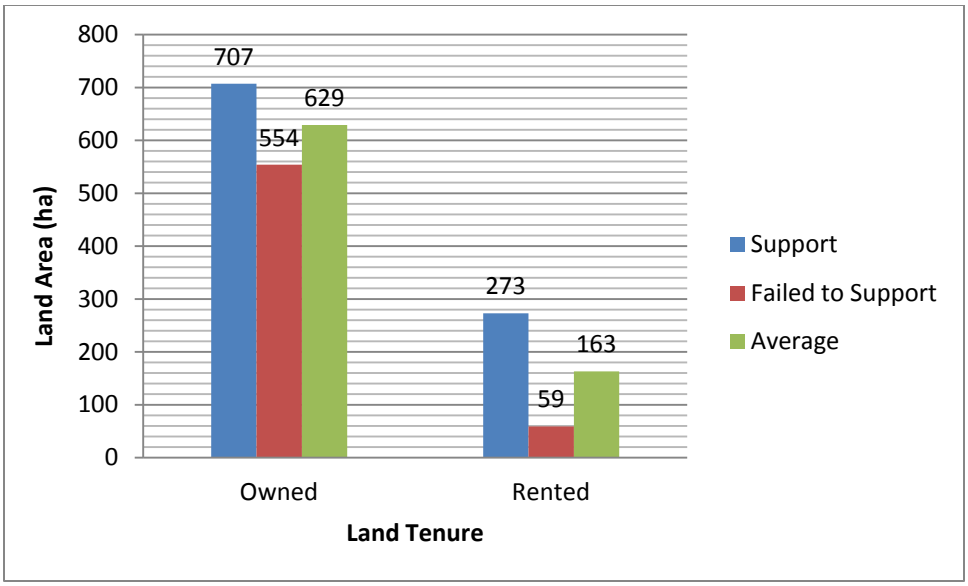

Figure 4.3: Quantity of land (ha) owned and rented by farmers related to their attitudes towards lease hunting (Source: Author's Calculations)

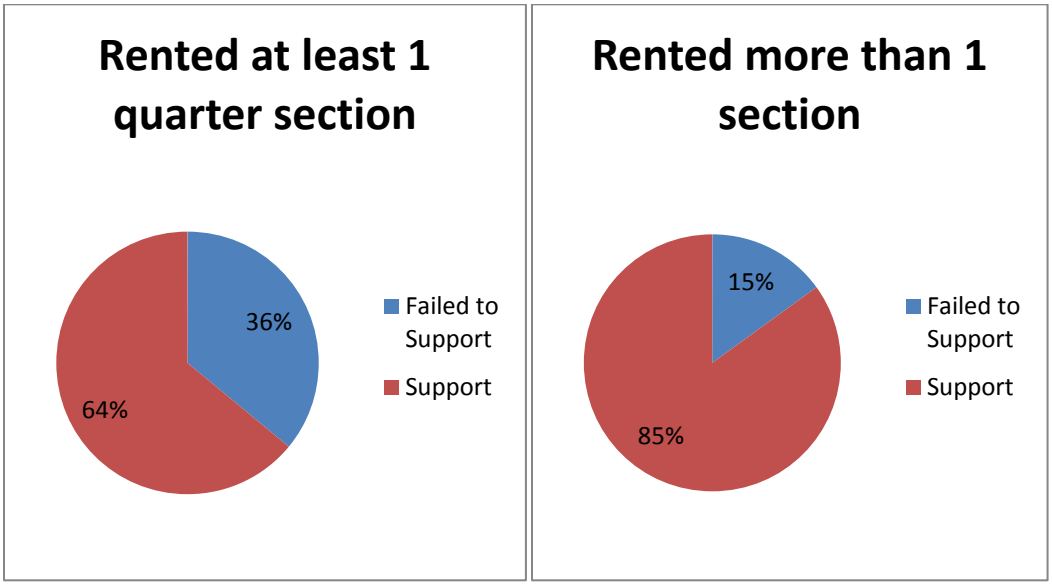

Figure 4.4: Relationship between attitude toward the introduction of lease hunting and the area of rented land (Source: Author's Calculations)

4.3.4 Relationship between the perceived quantity of wildlife and attitude to lease hunting

The survey asked farmers about their perceptions toward the quantity of wildlife provided by their land. In particular these questions focused on the farmers' perceptions of white-tailed deer and mule deer populations. The means in terms of habitat quality for the three regions were 7.5 at Biggar, 4.7 at Eston, and 6.9 at Esterhazy.

Somewhat different are the descriptive statistics for the perceived abundance of white-tailed deer (Q2) with an overall mean of 5.96. The regional differences are significant while at Biggar and Esterhazy the perceived white-tailed deer abundance was above average at 6.45 and 6.86 respectively, whereas the mean for the Eston area was significantly smaller at 2.37. These perceived values are consistent with the actual number of white-tailed deer density in Saskatchewan. When looking at the perceived mule deer density (Q3) the three geographical regions have different perceived mule deer abundance. The highest perceived density is in the Biggar area with average of 5.79. The Eston area is lower at 3.0. And the Esterhazy area is lowest at 0.73. The answers from Q3 tie in with the observed differences of overall wildlife density –that is Biggar has the highest perceived overall wildlife density and the highest actual wildlife density (Arsenault, 2003).

A follow-up question was included to evaluate whether there was a link between perceptions of relative wildlife abundance and attitudes to lease hunting. The question asks "*Do you consider the white-tailed deer population too high?*" (Q2a) and "*Do you consider the mule deer population too high?"* (Q3a). The answer options were limited to "*yes*" or "*no*". The survey revealed that the farmers who support the introduction of lease hunting perceived a higher population of white-tailed deer than those farmers who failed to support the initiative (Table 4.3). One interpretation of this attitude is that the failed-to-support group have a lower tolerance for

white-tailed deer as they perceive them a nuisance at a lower subjective density and as such do not want to discourage hunting activity by charging a fee for access. Alternatively, those that reported larger perceived white-tailed deer populations feel that the value of their hunting resources may be higher, and therefore they could support the introduction of lease hunting. Among farmers who felt there were too many mule deer (Figure 4.5) on their land and supported the introduction of lease hunting, the average subjective quantity of mule deer was higher. This result could mean that the failed-to-support group have a lower tolerance for mule deer as they perceive them a nuisance at a lower subjective density than those who are supporting the introduction of lease hunting.

Table 4.3: Perceived abundance of wildlife, white-tailed deer, and mule deer in relation to the support of lease hunting (Source: Author's Calculations)

	Support[a]	Failed to support	All
Wildlife	6.55 (2.15)	6.72 (1.96)	6.64 (2.05)
White-tailed	6.22 (2.86)	5.72 (2.54)	5.96 (2.70)
Mule	2.6 (3.22)	2.05 (2.79)	2.34 (3.00)

[a] Perceived abundance was rated [0;9] 0=least and 9=most abundant

4.3.5 Attitude to lease hunting and to hunting in general

Another factor investigated was whether farmers who normally allowed hunters on their land had a different attitude about lease hunting than those who normally restrict hunter access. Farmers who allowed hunting during the 2008 hunting season were more likely to support lease hunting than those farmers who did not allow hunting during this same period. Among those farmers that restricted hunter access, approximately 51% supported the introduction of lease hunting, while of those who allowed hunting on their land during the 2008 hunting season, approximately 93% supported lease hunting (Table 4.4; 4.5 and Figure 4.6). Approximately 70% of farmers were asked for permission by hunters to access their land during the 2008 hunting season. This is not an unexpected result – farmers who allow

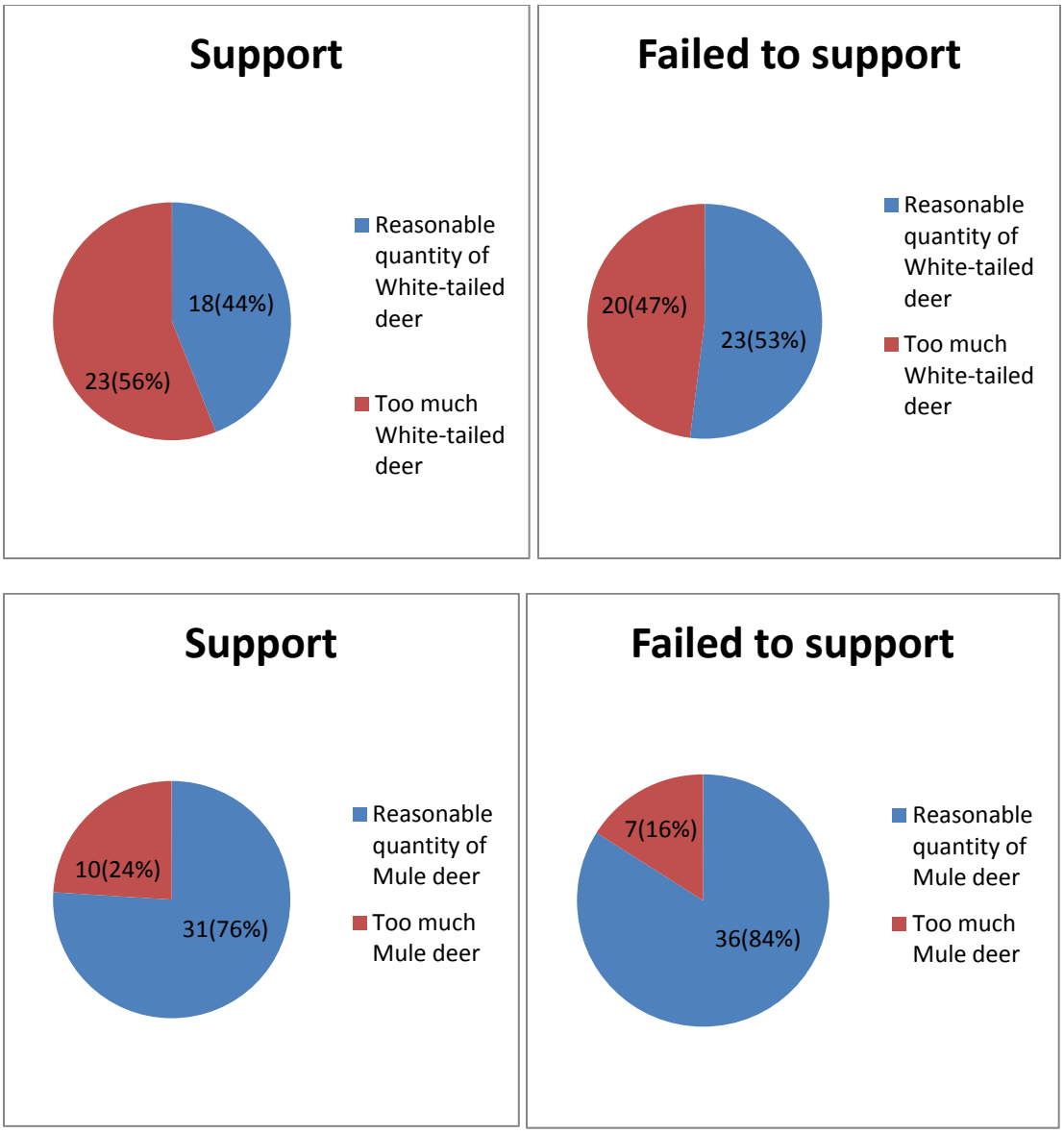

Figure 4.5: Relationship between subjective quantity of white-tailed deer and mule deer and support of lease hunting (Source: Author's Calculations)

hunters already bear costs and inconveniences associated with having hunters on their land. In particular, these farmers understand the costs of allowing hunters to use their land. Also, it is clear that these farmers are not opposed to hunting so they would not oppose the introduction of lease hunting for any specific philosophical opposition to hunting.

Table 4.4: Farmer attitude toward Lease hunting (Source: Author's Calculations)

	Support (n=41)	Failed to support (n=43)
Restricted Hunting during the 2008 season	51% (21)	49% (21)
Allowed Hunting during 2008 season	93% (38)[a]	74% (32)
Hunters asked for permission 2008 season	73% (30)	65% (28)
Problem with hunters	39% (16)	23% (10)
Provided Services to hunters	5% (2)	9% (4)
Did not allow Hunting in 2008	7% (3)	26% (11)
Posted some of his or her land	8% (20)	7(16%)

[a:] Appendix 4.8

Table 4.5: The portion of land that is posted with the sign: "Hunting with permission only"

(Source: Author's Calculations)

	Support	Failed to Support	All
Average land posted, among those who posted some of their land	12.5%	10.12%	11.28%
Average land portion posted	64%	62%	63%

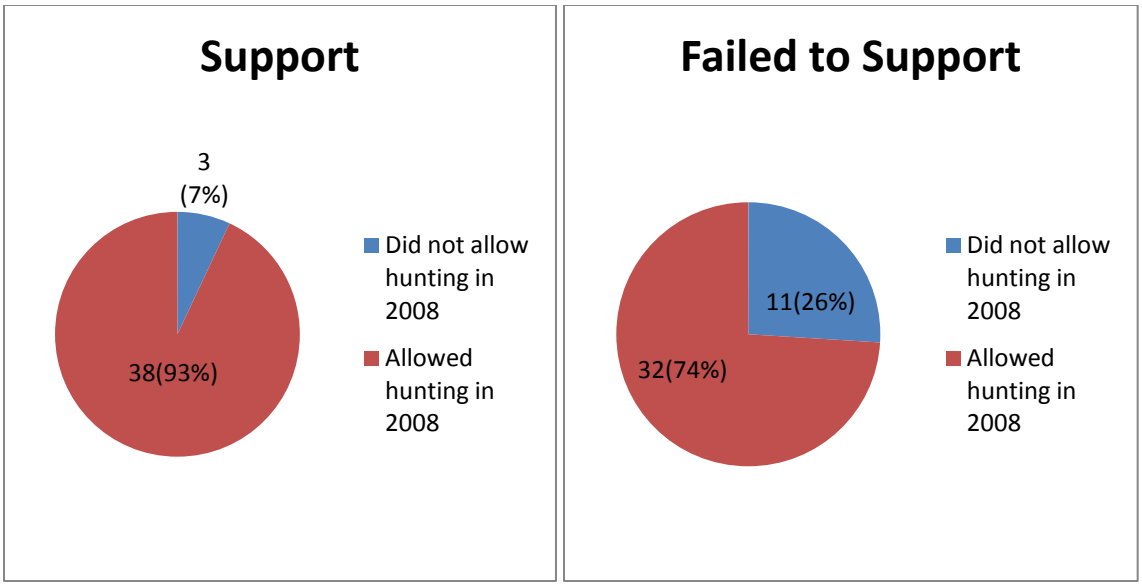

Figure 4.6: Attitude to lease hunting in the light of allowing hunting in 2008 (Source: Author's Calculations).

The respondents were asked about experiences with hunters who accessed their land in the past. Approximately 31% of respondents indicated they had problems with hunters on their land and these respondents were more likely to support the introduction of lease hunting (61.5%[25]) than those who did not have problems. Though this finding is only weakly significant, it is consistent with the literature that having control over hunter access and activities within a hunting lease agreement is the number one reason to introduce lease hunting (Wright and Kaiser, 1998; Hussain, 2006). Specifically this literature reports that having a written contract between the hunter and the farmer is more important than the monetary compensation. The written contract ensures a mutual understanding, clearly defining rights of both parties and as such reduces uncertainties, making farmers more willing to participate in the transaction.

[25] From: 26 respondents had problem with hunters and 16 of those who had problem with hunters were in favor of fee hunting, making it a 61.5% support rate.

The survey was also used to determine whether the sample population of farmers were involved in providing any outfitting-type services to hunters who hunted on their land or in their area. Only 7% of the respondents indicated that they provided services to hunters. The services were varied and as such not easily comparable, ranging from allowing use of their phone, pulling them out of a field when their vehicles were stuck, to providing shelter. Two farmers admitted that they charged outfitters $25/day/hunter to access their land. However, they indicated that they did not charge private hunters, only outfitters who brought groups of hunters. Although the sample size is very small it is interesting to note that twice as many farmers who failed to support lease hunting had provided services to hunters than those farmers who supported the introduction of the institution of lease hunting. The finding might imply that those farmers that are already providing services to hunters are unofficially and illegally introducing lease hunting. Therefore, introducing it legally would mean less benefit to them as it would involve extra administration cost and the paying of taxes related to the lease hunting venture. On the other hand, farmers who are not providing services to hunters might be more inclined to support lease hunting as it opens an alternative option to increase revenue from their land.

When introducing a new business certain aspects of the operation are more important than others. To better understand the characteristics of a lease hunting agreement that would make such an institutional change more or less attractive, subjects were asked to rate the importance of characteristics on a scale of 1 to 10, where 10 was the most important. These questions were asked only if subjects answered yes or were uncertain to the question of whether they would be in support of lease hunting (Figure 4.7).

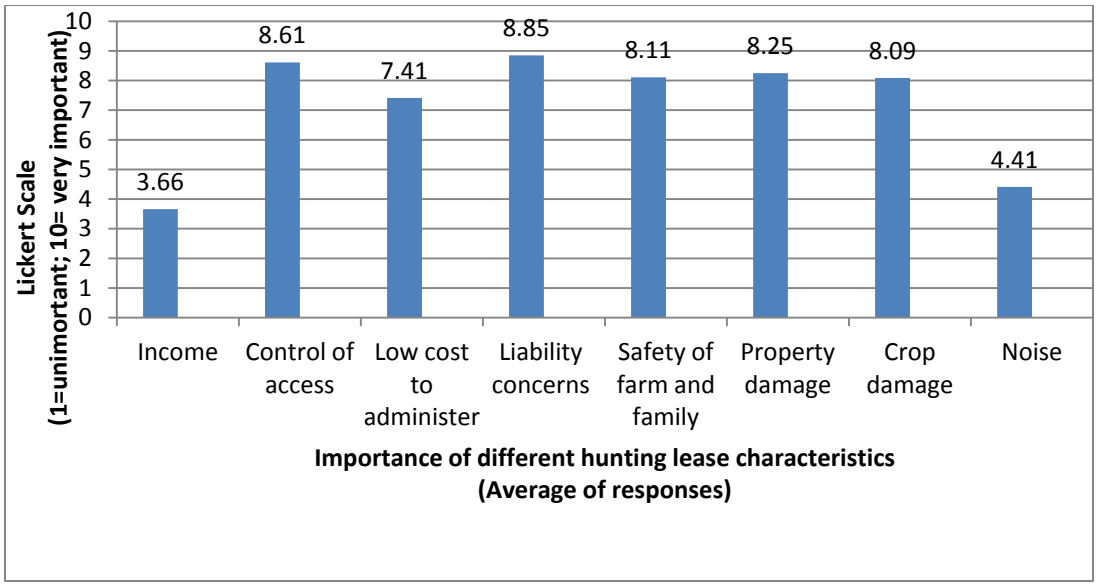

Figure 4.7: Importance of different hunting lease agreement characteristics among supporters of lease hunting (Source: Author's Calculations).

Six out of the eight attributes were rated by farmers as fairly important, receiving ratings between 7.41 and 8.85 (calculated as an average of responses), and two attributes received the rating of fairly unimportant. Interestingly, income was not perceived by participant farmers to be a particularly important characteristic of lease hunting. In fact the income characteristic received the lowest rating of all with a mean importance of 3.66 and a standard deviation of 2.79. The low rating of income might also reflect a perception by farmers that lease hunting would provide only limited income opportunities. The other characteristic that was rated as fairly unimportant was the concern about noise pollution. The other six attributes: control of access, low cost to administer, liability concerns, safety of farm and family, property damage, and crop damage all received the fairly important rating. The control of access, rated as 8.61, and liability concerns, rated as 8.85 were the most important reasons for private land owners to support the introduction lease hunting (Figure 4.7). It is likely that control of access was important to farmers due to the

fact that having a written contract with hunters on their land gives them a sense of empowerment that increases subjective well-being. The liability issue also can be managed easier with a written contract that could decrease negative legal and financial consequences. It is very likely that a legal document that clarifies the situation between farmers and hunters appears to be more important to a participating farmer than monetary compensation, which supports the above claim cited in the lease hunting literature (Conover, 1998; Wright and Kaiser, 1986; Hussain, 2005). Another observation is that the perceived safety of farm and family attribute of a hunting lease venture was rated 8.11 on average, which is slightly less than those of liability concerns, control of access, and property damage.

From a policy perspective an important consideration when developing and implementing an institutional change such as lease hunting is to focus on what group or organization would be best to manage the program. This has implications for cost, acceptance and efficiency of the approach. To help understand farmer preferences around the administration and delivery of the hypothetical lease hunting system, farmers were asked to rank institutional characteristics, and specifically to identify the organization or group they felt would be the best to administer or oversee a lease hunting approach. Farmers could choose from the following organizations: private outfitters, a farmer-hunter co-operative or a farmer co-operative, the government, a hunting organization or administered by the farmers themselves (self-administration), and they could choose more than one option. The most popular choice was self-administration, with 44% of farmers identifying this as the preferred option (Table 4.6). The second most popular option was a farmer-hunter co-operation, 34%, and a close third was a system administered by a hunting organization. For this option people mostly identified the SWF as an appropriate organization. It is interesting to note that the least popular option was a government-administered solution. The

Table 4.6: Expressed preferences for lease hunting administration among all respondents and differentiated responses by supporter and uncertain farmers (Source: Author's Calculations).

Administrative organization[1]	All (n=46)	Supporter (n=41)	Uncertain (n=5)
Outfitter	23.91% (11)	26.83% (11)	0
Farmer/Hunter Co-op	34.78% (15)	34.15% (15)	20% (1)
Farmer Co-op	17.39% (8)	19.51% (8)	0
Government	15.22% (7)	17.07% (7)	0
Hunting Organization	32.61% (15)	31.71% (13)	40% (2)
Self Administration	43.48% (20)	43.9% (18)	40% (2)

[1]: Respondent could choose more than one option

typical justification among respondents to reject the government involvement was the perceptions of an already seemingly significant presence of government rules and regulations.

To understand the reasons that farmers opposed the lease-hunting proposal, those who stated they did not support the introduction of lease hunting were asked to rate the importance of several reasons for their decision. The rated characteristics were: hunting rights, administration cost, liability concerns, enforcement costs; ethics of hunting, rated on a scale of 1 to 10 where 1 reflected strong disagreement and 10 represented strong agreement. The hunting rights characteristic reflects that respondents think that hunting is a basic right for Saskatchewan residents that should not be taken away by charging hunters for access. The variable administration cost was intended to represent concerns that introducing lease hunting would result in increased administration cost associated with enabling, or restricting, hunters accessing their land. Liability deals with the concern about the consequences of a potential accident while

lease-hunting customers are on private land. Enforcement costs represented concerns, on the part of the farmer, that enforcement costs in the lease hunting business would be prohibitively high. Ethics of hunting intended to assess whether respondents though it not ethical to hunt and therefore reject lease hunting.

The primary concern of respondents was about the enforcement cost of hunting regulations, which is similar but not identical to the combination of control of access (8.61) and low cost to administer (7.41) among supporters of lease hunting (Figure 4.7 versus Figure 4.8). Concerns over liability issues were also relatively important. This reflects concern that in the event of a hunting accident the farmer is found liable. In third place was the argument that hunting is a basic right and farmers should not charge money for hunting. Surprisingly expressed attitudes on the basic right argument was quite extreme with respondents either voting strongly for or strongly against. The practical consideration that opening a lease hunting operation might involve significant costs in terms of administration (6.39) and enforcement (7.62), which could mean a lease-hunting venture might not make much business sense. The least important reason was ethical considerations. These are important results, as they tell us that perhaps farmers that are rejecting the idea of lease hunting are against it for practical and not ideological considerations. Furthermore, when comparing the results with those farmers who would be supportive of introducing lease hunting it is interesting to note that for both groups the primary concerns centered on administration and enforcement costs. The liability issue came up as the most important attribute among supporters (8.85) while it was the second most important among the failed to support group with an importance value of 7.35. It is also interesting to note that the overall ratings are lower in every category in the failed-to-support group and it is probably so

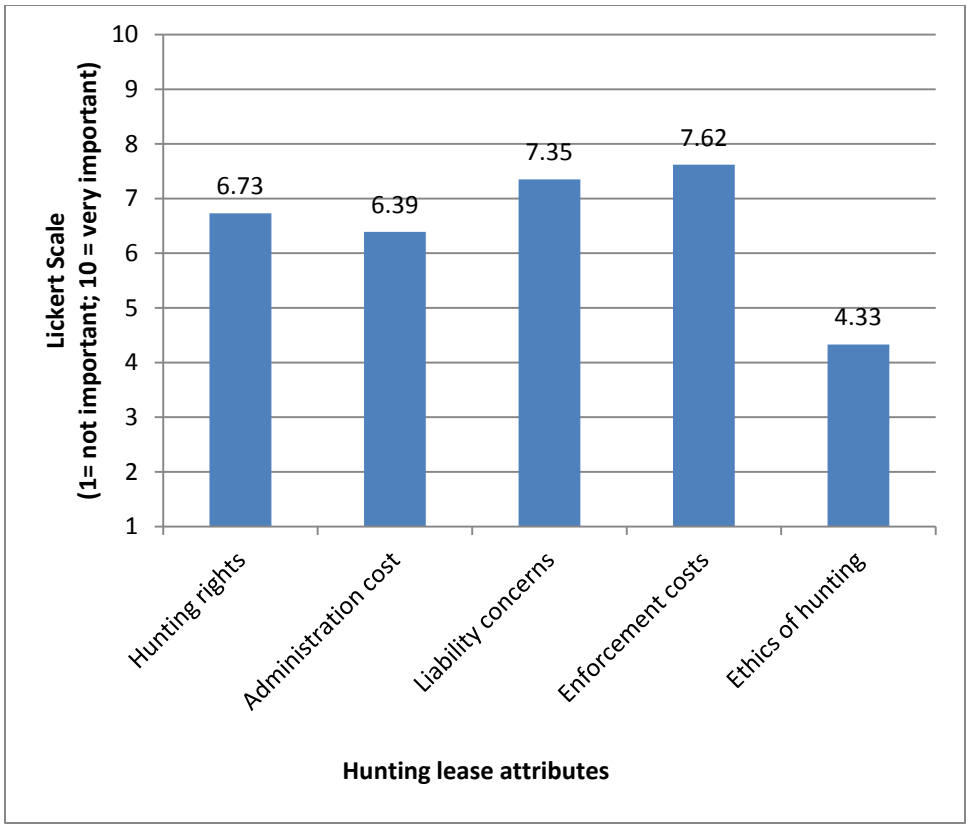

Figure 4.8: Rating of the importance of lease attributes among farmers who failed to support the introduction of lease hunting (Source: Author's Calculations).

because the supporters are expressing opinions about a venture that is an option that might be realized, hence the dangers might be magnified, as opposed to the failed-to-support group.

4.4 WTA for a day of recreational hunting access

As discussed in chapter three, one of the objectives of this research was to quantify the level of compensation required by farmers to allow hunters to access their private land. To meet this objective the survey included a hypothetical willingness to accept question (WTA). For those farmers who supported lease hunting on their land, WTA for a day of hunting access ranged from $10/day/hunter to $500/day/hunter with a median willingness to accept of

$50/day/hunter (Table 4.7). These values appear to be consistent with WTA values in the lease-hunting literature. For example, in Florida the lease rates for white-tailed deer hunting (Marion 1989) ranged from $64/day to $256/day,[26] which falls within the range of the present study results of $10/day to $500/day. Gray's 1998 study that estimates $US9.91/acre/year for the whole US translates into a Saskatchewan equivalent of $214/day,[27] which is significantly higher than the median $50/day found in the survey.

It should be noted that six of the respondents who indicated that they would be willing to charge for hunting leases were unable or unwilling to quantify what they would charge for a day. Furthermore, 10 of the farmers (26%) who were opposed to lease hunting and three (60%) of the undecided individuals were willing to indicate a level of compensation they would accept for allowing hunting access to their land. This might reveal that the respondents felt that since selling hunting leases is illegal and infeasible those who answered 'against' could not get beyond the current legal status of lease hunting. In other words although farmers might be opposed to the introduction of lease hunting in their area that did not mean that they were opposed to it at all prices. It could be that practically they said 'yes' to lease hunting, when the price is right, or simply they felt pressure from the interviewer to provide an answer to a hypothetical question.

It is important to understand some issues concerning the WTA instrument. The majority of respondents had difficulty quantifying the level of payment they would be willing to accept. The uncertainty about the real value of a day lease is reflected by the fact that the most common answer for the WTA for a day of hunting access was $100/day (Table 4.7). Therefore, the mode

[26] http://myfwc.com/hunting/season-dates there are 72 rifle hunting days for deer. As in Marion, 1989 the WTA values are quoted as $value/acre/year, and in my study it is given as $/day/hunter; I used the number of hunting days in a year, in this case in Florida is 72, took the average size of a land in the survey which was 630 hectares (Table 4.1) and transformed the acres to hectares and then multiplied it with 630 to have comparable measures.

[27] $US9.91/72(number of hunting days)*2.47(hectare multiplier)*630(average land owned by surveyed farmer). At the time of writing this section in 2011 October the US and Canadian dollar was in parity.

Table 4.7: Farmers' perceived value of one day of hunting lease [$/hunter/day] (Source: Author's Calculations)

Attitude towards hunting leases	Mean (S.D.)	Median	Mode	Min	Max
ALL (n=48)	110.78 (162.38)	51.25	100	10	1000
Supporter (n=35)	91.29 (100.34)	50	100	10	500
Against (n=10)	92.73 (97.25)	50	100	0	300
Uncertain (n=3)	367.5 (547.76)	52.5	N/A	50	1000

WTA for a day of hunting access was $100/hunter/day at every level of support with close to one third of the respondents providing this value. It is interesting to note that five of the farmers provided information about their WTA for one day of hunting for an American citizen [$/day]. The mean ($560) is more than five times greater than the similar value hypothetically charged for a non-American citizen ($110). According to these respondents it appears that American hunters are perceived as a separate group of consumers. This finding is consistent with the common practice that hunting licenses, sold by the Provincial Ministry of Environment are price discriminating based on residence, and farmers are well aware that the majority of foreign hunters are from the US.

To provide some reflection of whether there is a scale effect to hunting lease pricing, farmers were also questioned about the level of payments required to allow hunter access for a week and for a single season. The reported mode for a week of access ($500) (Table 4.8) was five times greater than the mode for a day of access ($100) within the supporters' group. The median for a week of access ($300) is exactly six times greater than the median for a day of access ($50) among supporters of lease hunting. The farmers appeared to be just multiplying the daily fee by the number of hunting days in week, since until 2009 Sunday hunting was restricted.

Therefore it seems that the farmers do not perceive any economies of scale, selling one day of hunting lease as a bundle of seven, nor any decrease in transaction costs associated with longer term contracts. That could mean that farmers did not think about their response enough to differentiate pricing. For a season of access the mode is $1,000, which is twice the value of the mode of a week access and ten times greater than the mode of a day access (Table 4.8). There does appear to be some consideration of decreased transaction costs or economies of scale. A season generally means the fall hunting season, as it is specified by the hunters and trappers guide issued yearly by the Saskatchewan Ministry of Environment (2008a). The average Saskatchewan hunter spent an average of 12 days hunting, foreign hunters spent an average of 1.07 days. The expenditure was $106 for SK and $1,286/hunting trip for foreign hunters (Murray, 2006). The difficulty of coming up with a reasonable WTA for farmers is supported by the large number of $100 bids for the day access and the decreasing number of responses as the length of the lease increased. For that group of farmers who were uncertain about lease hunting values are significantly larger than in the supporter or against group due to one outlier response ($1000 for a day of hunting access and $7000 for a week of hunting access). It appears that this farmer was against fee hunting and may be submitting a protest bid such that access would not be granted unless they received significant monetary compensation.

Table 4.8: Willingness to accept for one week and one season of hunting access [$] (Source: Author's Calculations).

Attitude towards hunting leases	Mean (S.D.)	Median	Mode	Min	Max
	ONE WEEK				
ALL (n=29)	554.1 (1259.3)	300	500	50	7000
Supporter (n=24)	340.8 (233.1)	300	500	70	1000
	ONE SEASON				
ALL (n=21)	1094.1 (1405.5)	1000	1000	200	7000
Supporter (n=17)	827.9 (401.7)	1000	1000	200	1500

To provide an estimate of the regional economic value of hunting leases for the three study areas the total number of farms within the region were considered (1,396 in Biggar, 471 in Eston, and 794 in Esterhazy). The average WTA for access was estimated from the responses at $110.78/day and the number of days in the rifle-hunting season for white-tailed deer is 21 days. The total number of farms in the three study areas was 2,661 assuming that not all the farms are suitable for hunting I hypothesize for the sake of simplicity that two out of three farms are suitable for hunting in the study area. However, not all farmland is suitable for hunting, at the same time it is quite certain that the three survey areas are rich in wildlife and a prime area for hunting; hence assuming that more than half of the farm land is suitable for hunting is not unreasonable. To counterbalance the potential for overestimation I also assume that during the hunting season every farm that is suitable for hunting is used by one hunter per day. It is an obvious underestimation, as land that is attractive to hunters are used by more than one hunter per day. The other assumption to ensure conservative estimates is that I take into consideration only the duration of the white-tailed rifle season meaning that I excluded from the calculation the non-rifle white-tailed season, and any other game and bird seasons. Based on these assumptions the estimated revenue from lease hunting to the three surveyed area during a white-tailed rifle

season is approximately four million dollar ($4,126,998 =2,661*2/3*110.78*21). To put into perspective for that limited area of the province during the 2010/11 fiscal year the federal government paid out $9.5 m for wildlife damage compensation in the province of Saskatchewan. Consequently, if it is assumed that farmers participating in lease hunting would no longer be eligible for wildlife damage compensation, the introduction of lease hunting would save up to $9.5m for taxpayers.

4.5 Qualitative response analysis

In this section, a probit model is used to provide insight into the characteristics that influence or determine farmers' attitudes towards lease hunting. Merging uncertain and against answers were combined to form the category of failed to support. This approach was a viable way to reduce options (Greene, 2007) without losing the primary objective of the analysis[28].

Farmer attitude toward lease hunting is explained by several variables such as demographic characteristics, attitude towards hunting, physical attributes of their property and past history toward hunters. These variables were chosen after running several regressions to identify the combination of variables that gave the best statistical fit.

Education (Edu)[29] was selected from the demographic variables. Area of rented land (Renha) was selected from the agricultural business venture descriptive variables. The physical characteristics of the wildlife and wildlife habitat on the farmers' land included in the model were perceived abundance of wildlife and wildlife habitat (Q1) and the quadratic version ($Q1^2$), perceived abundance of white-tailed deer (Q2), and the quadratic version ($Q2^2$). A dummy

[28] Train (2009) describes examples as he was pooling certain choice alternatives together to make his models more relevant to the research question such as the number of cars families are choosing to own: instead of having a large number of categories he reduced them to two: families who have zero vehicles and to families who have at least one vehicles, while still gaining meaningful information from his investigation.

[29] Less than grade 12=1; High School completed=2; Some University=3; Min Bachelor Degree=4;

variable reflected the perception of white-tailed deer populations (toomawt) is equal to 1 if a farmer perceives that there are too many white-tailed deer, otherwise the variable is 0. Another dummy variable reflecting perceptions of mule deer populations (toomam) is defined similarly. Other variables were included that describe farmers' attitudes to hunting and to hunters including a dummy reflecting whether a farmer has been asked for permission to hunt on their land (hp2008). Finally a dummy was added to reflect if a farmer allowed hunting during the 2008 hunting season (ah2008).

The basic discrete choice model for the decision process of the farmer facing the choice of introducing lease hunting on her farm is represented in Equation 4.2. Equation 4.3 shows the mathematical equivalent of the dependent variable Y and Equation 4.4 shows the i^{th} farmer predicted response $y_{i,}$ while equation 4.5 is the probit regression model used in explaining the attitudes and other variables of supporting lease hunting.

$$Y = F(demographical, attiudinal\ varibles) = \begin{cases} Support \\ Failed\ to\ Support \end{cases} \quad (4.2)$$

$$Y = \sum_{i=1}^{84} y_i \quad (4.3)$$

$$y_i = \begin{cases} 1 \text{ if the } i'\text{th farmer would support intorducing lease hunting on his or her land} \\ 0 \text{ otherwise} \end{cases} \quad (4.4)$$

For the model specification the following model was applied

$$Y = C + \beta_1 Q_1 + \beta_2 Q_1^2 + \beta_3 Q_2 + \beta_4 Q_2^2 + \beta_5 Toomwt + \beta_6 Toomm + \beta_7 hp2008 + \beta_8 ah2008 + \beta_8 Edu + \beta_{10} Renha + \varepsilon \quad (4.5)$$

The regression results for this model are presented in Table 4.9 with the calculated marginal effects presented in Table 4.10.

Table 4.9: Probit regression model of attitude towards lease hunting (Source: Author's Calculations).

Independent variables	Coefficient (S.D.)
Constant: (C)	-1.86 (1.14)
Perceived abundance wildlife and wildlife habitat [0;9] (Q1)	0.40(0.37)
Perceived abundance of wildlife and wildlife habitat squared($Q1^2$)	-0.04(0.03)
Perceived abundance of white-tailed deer [0;9] (Q2)	-0.25(0.28)
Perceived abundance of white-tailed deer squared($Q2^2$)	-0.04(0.03)
Too many white-tailed binary (toomawt)	-0.64(0.41)
Too many mule deer binary: (toomam)	-0.77*(.045)
Asked for permission to hunt binary: (hp2008)	-0.78* (0.46)
Allowed hunting binary: (ah2008)	1.20**(0.51)
Education: (Edu)	0.19 (0.17)
Number of hectares rented for agricultural production: (Renha)	0.003** (0.001)

Prob>Chi2=0.0052
LR Chi2(10)=25.08
Log likelihood=-45.66; Pseudo R^2=0.2154
[a] Significant at the 1%***, 5%** at the 10%* level.

Table 4.10: Marginal effect of the probit regression model attitude towards lease hunting (Source: Author's Calculations).

Independent variables	dy/dx (S.D.)
Perceived abundance of wildlife and wildlife habitat [0;9] (Q1)	0.16(0.15)
Perceived abundance of wildlife and wildlife habitat squared($Q1^2$)	-0.02(0.01)
Perceived abundance of white-tailed deer [0;9] (Q2)	-0.10(0.11)
Perceived abundance of white-tailed deer squared($Q2^2$)	0.02(0.01)
Too many white-tailed binary (toomawt)[#]	-0.25 (0.15)
Too many mule deer binary: (toomam)[#]	0.29*(0.15)
Been asked for permission to hunt binary: (hp2008)	-0.30*(0.16)
Allowed hunting binary: (ah2008)[#]	0.43*** (0.15)
Education: (Edu)	0.07(0.07)
Number of hectares rented for agricultural production: (Renha)	0.001*** (0.004)

[#]dy/dx is for discrete change of dummy variables from 0 to 1
Significant at the 1%***, 5%**, and at the 10%* level.

The probit model regression is significant at the 1% significance level, based on the small p-value of the LR test: 0.0051[30]. The specification produces two coefficients that are statistically significant (Table 4.10). The significant parameters were renting more land for agricultural production (Renha), and whether the farmer allowed hunting on her land during the 2008 season (ah2008). Each of these parameters had positive coefficients indicating that they increased the probability that the farmer would support the introduction of recreational lease hunting. Based on the results of the binomial probit model (Equation 4.5) as presented in Table 4.9 a typical farmer who would support lease hunting would be someone who rented additional land for agricultural production, allowed recreational hunters access to their land during the 2008 hunting season, and perceived that there was an excess number of mule deer on her land. The predicted probability of the support of the introduction of recreation lease hunting can be calculated using these coefficients from Table 4.9. The increase in probability attributed to a one-unit increase in a given predictor is dependent both on the values of the other predictors and the starting value of the given predictors[31].

Marginal effects have been evaluated at the mean and resulted in four statistically significant variables: too many mule deer (Toomam); been asked to permission to hunt (hp2008); allowed hunting (ah2008) and; number of hectares rented for agricultural production (rentalhectares). (Toomam) is a dummy variable. Toomam's marginal effect from going from 0

[30] Prob>Chi2=0.0051 is the probability of getting chi^2 statistics (18.5) or higher if there is no effect of the predictor variables. In this case this is less than 0.01 (alpha=a willingness to accept of type I error), which means at least one of the predictor variables are not equal to zero.

[31] For example, if we hold ah2008 constant at zero, the 100 acres increase in renta from 200 to 300 has a different effect than the 100 acres increase from 1200 to 1300. For a given farmer, the predicted probability of support is F(-1.86+ah2008*1.2+...+ renha*0.003) where *F* is the cumulative distribution function of the standard normal. However, interpretation of the coefficients in probit regression is not as straightforward as the interpretations of coefficients in linear regression or logit regression. A positive coefficient means that an increase in the predictor leads to an increase in the predicted probability. A negative coefficient means that an increase in the predictor leads to a decrease in the predicted probability.

to 1 increases the probability that the farmer who perceives that she has too many mule deer on her land will support the introduction of lease hunting. The marginal effect of the dummy (hp2008) decreases the probability that a farmer will support the introduction of lease hunting. For farmers where hp2008 is true recreational hunters already ask for permission to hunt on their land, hence they will not receive the most important lease hunting characteristic because they already have it: control over their land, which they would receive upon introducing lease hunting.

4.6 Price of the day hunting lease

In this section I will evaluate the factors that are likely to influence the minimum acceptable payment levels, among supporters of lease hunting, for one day of hunting. In order to better understand the factors that influence, the quoted price of a day hunting lease and to what degree, it is necessary to develop estimates based on an econometric analysis. It is important to note that the regressions employed deal with only a subset of all the farmers who have been surveyed. Some respondents, even though they were supportive of the introduction of recreational lease access hunting, were not able to provide a valid answer to the WTA question. Consequently I include all 35 valid observations from farmers who supported the introduction of lease hunting.

To perform this analysis I used a left censoring tobit regression (equation 4.6) to find statistically significant correlations between the dependent variable, which was the WTA value for 1 day of hunting access through a lease arrangement (*WTA1)* and the independent variables.

$$WTA1 = C + \beta_1 Q1 + \beta_2 Q1^2 + \beta_4 Q2 + \beta_4 Q2^2 + \beta_5 Manym + \beta_6 hp2008 + \beta_7 ah2008 + \beta_8 E1 + \beta_9 E2 + \beta_{10} E3 + \beta_{11} Renha + \mathcal{E} \quad (4.6)$$

where the independent variables include the subjective quantity of wildlife and white-tailed deer on the farmers' land rated using a scale of zero to nine (*Q1* and *Q2* respectively). The

quadratic terms $Q1^2$ and $Q2^2$ are modelling the point where the subjective quantity of wildlife and white-tailed deer reaches an optimal and after that point becomes a nuisance. “Too many mule deer dummy” (Manym), “Someone asked for permission to hunt on your land during the 2008 hunting season? Dummy variable. ” (Sea08), “Allowed hunting during the 2008 hunting season. Dummy” (Al08), education level with dummy variables (*E1*=less than grade 12; *E2*=Some University; and *E3*=Min Bachelor degree) the default education level was grade 12, and area of rented land (*Renha*). These independent variables were selected based on prior expectations of the impact on the dependent variable *WTA1*. The results from this regression are reported in Table 4.11.

The tobit regression shows that the quality of wildlife habitat (Q1) has a positive effect on the price a farmer would charge hunters for a one day hunting lease on their property (Table 4.11), until a certain point as $Q1^2$ is negative. In practical terms it means that leaving other variables constant the perceived quality of wildlife habitat increases the WTA for a day of hunting access up to a maximum. The maximum WTA is reached where the perceived abundance is 6 and at any higher perceived wildlife density levels-7, 8 and 9-the WTA starts to decrease. This finding supports the theory that too much wildlife can be a nuisance for farmers. That is, a unit of increase in the subjective evaluation (on a scale of 0 to 9) of wildlife habitat would increase the farmer’s WTA for a day of hunting by $31.73. In contrast, the subjective abundance of white-tailed deer (Q2) has a negative effect on the price farmers are willing to accept, when subjective abundance is greater than 4. It seems white-tailed deer tolerance is lower and after a certain level of subjective density the pest characteristics of the white-tailed deer outweighs its positive qualities.

Table 4.11: Tobit Regression of WTA of a day of hunting[b] lease (Source: Author's Calculations).

Independent variables	Coefficient[a] (S.D.)
Constant: (C)	-361.44*** (102)
Perceived abundance of wildlife and wildlife habitat (Q1)	72.24**(29.66)
Perceived abundance of wildlife and wildlife habitat squared($Q1^2$)	-4.33*(2.43)
Perceived abundance of white-tailed deer (Q2)	10.66(23.83)
Perceived abundance of white-tailed deer squared ($Q2^2$)	-2.44 (2.23)
Too many mule deer dummy (Manym)	-76.25** (32.89)
Too many white-tailed deer dummy (Manywt)	-54.26(37.09)
Someone asked for permission to hunt on your land during the 2008 season? (hp2008)	58.86* (32.53)
Allowed hunting during the 2008 season. (ah2008)	118.69** (54.78)
Education dummy variable1: Less than grade 12: (E1)	180.28***(47.98)
Education dummy variable12: Some university: (E2)	117.04***(39.26)
Education dummy variable3: Min Bachelor degree: (E3)	41.98 (37.28)
Number of hectares rented for agricultural production: (Renha)	0.16***(0.03)

[a]: Significant at the 1%***, 5%**, and at the 10%* level.

[b:]Tobit regression Number of obs = 35

LR chi2(12) = 29.21

Prob > chi2 = 0.0037

Log likelihood = -195.86 Pseudo R2 = 0.069

The predicted values share the variance 57%[32] of the cases as in the original wta1

[32]correlate wta1 yhat
(obs=35)

	wta1	yhat
wta1	1.0000	
yhat	0.7523	1.0000

Farmers with less than grade 12 education (E1) reported higher WTA values compared with those who had higher education. The regression results indicate that these farmers with lower levels of education would charge $180 more, on average, for a day of hunting lease access than farmers with a high-school degree. The model results indicate that for each additional hectare a farmer rents for agricultural production (Renha), she reported a greater WTA of $0.16 per day for recreational hunting access. This is an interesting finding since it related somewhat to the size of the property, but when I checked the effect of land owned, not rented, by running the regression with land owned, there was no relationship. This result might suggest that farmers that are participating in agricultural production at a level when they need to rent additional land are more willing to explore additional revenue opportunities, even though farmers on average who support the introduction of lease hunting do not consider the revenue potential of lease hunting important.

4.7 Summary of the Outfitter Telephone Interviews

The survey of outfitters, as discussed in earlier chapters, was intended to provide information on the demand side of recreational hunting activity in Saskatchewan. In particular, we sought the attitudes of individuals whose businesses are based on the provision of high-quality hunting opportunities. All interviewed outfitters were members of the SOA and based their operations on clients that are non-resident hunters; mainly US based hunters since non-resident hunters can hunt big game only with outfitters and only in selected northern Saskatchewan wildlife management zones. Among the 54 outfitters listed I randomly selected 18

0.7523^2=0.5659

members that were contacted by phone. Six of the contacts were not available and two refused to participate in the interview, leaving 10 usable surveys.

All surveyed SOA members were opposed to the introduction of lease hunting. The main reasons stated for rejecting the proposal was that the outfitters felt that the cost of the hunting lease would either be absorbed by the outfitters or need to be passed on to clients discouraging potential customers. Another major concern was an increase in illegal outfitting with the implementation of lease hunting. The logic is that outfitting at the moment is a highly regulated industry and by introducing lease hunting the outfitters felt that it would become easier for farmers to provide other services to hunters currently provided only by registered outfitters. As one of the outfitters put it- "Basically, you are transforming farmers to outfitters, making the outfitter business more competitive". Outfitters were against hunting leases due to the perceived negative effects on their privileges of selling hunting-related services in Saskatchewan. However 30% of the interviewed outfitters claimed that it would not affect them since they provide all their services on crown land, but they were still against the introduction of lease hunting for reasons that relate to losing exclusivity of the outfitting profession. Among the seven outfitters who some of the time operate on private land, two had never been refused access to private land while five were refused access only 1% to 10% of the time.

The outfitters were also asked about which organizations they would like to see administering lease hunting in Saskatchewan. However, since all surveyed outfitters were against the introduction of lease hunting this question was not valid. According to the outfitters lease hunting occurs in the province, albeit illegally. To the question "*Do farmers charge money for the provision of their services, or ask for favours, maybe some other kind of compensation they request?*" three outfitters answered yes and two out of three provided exact amounts paid

for land access. The range was between $50/day to $500/day for big game hunting and for bird hunting was $25/day. The prices they quoted are similar to what farmers indicated during the farmer survey. The $25 per hunter per day for bird hunting was a very typical answer, especially in the Eston region. One outfitter told me after the interview that in the Quill lakes region it is 100% paid hunting. In spite of being illegal, lease hunting is already well established in certain regions of Saskatchewan.

4.8 Conclusion

Saskatchewan farmers are evenly split on the idea of introducing lease hunting on private land. Farmers who are actively involved in agricultural production on their land and rent additional land to what they own are more likely to support the introduction of hunting leases. It is notable that all participant farmers who rent more than 518 ha (1280 ac), supported the introduction of recreational lease hunting. Also the results indicate that people who allowed hunting on their land are more likely to support the introduction of lease hunting. Interestingly demographic variables such as age and education did not seem to have an effect on attitude towards lease hunting.

The WTA for a hypothetical lease hunting contract also has been estimated. For farmers who support lease hunting the average WTA for one day of hunting access was estimated to be just over $90, while the combined average of all the respondents irrespective of supportiveness was $110. The results from the Tobit regression to determine which factors are influencing the WTA values for a day of hunting lease showed that the perceived abundance of wildlife and wildlife habitat increased the WTA up to the perceived level of 6, while above that the WTA decreased. This suggests that wildlife after a certain density probably imposes some pest characteristics; hence farmers do not want to scare away hunters by charging them too much.

To identify the attributes that have the most influence on SK farmers' attitudes toward lease hunting a binary *probit* model was used and it reveals that farmers were more likely to support lease hunting if they had the following characteristics: more rented land; allowed hunting during the 2008 hunting season and; thought that they have too much mule deer on their land. The model also suggests that farmers were less likely to support lease hunting if they had been asked permission to hunt.

Finally, the outfitter interviews showed that SK outfitters are strongly against the idea of introducing lease hunting and think that such policy change would bring on significant unregulated competition and these operators are of the view that the moment a farmer has the right to sell hunting leases she is a semi-outfitter. Outfitters also communicated that illegal lease hunting is present in rural SK and 30% of the interviewed outfitters mentioned that farmers charge money or other types of compensation so they can access farmers' land with their hunting clients. The amount outfitters quoted, $50 to $500/day, fall into what farmers quoted as WTA for a day of lease hunting. Also both outfitters and farmers told me about the current practice of farmers charging $25/day/hunter for bird hunting. The next and final chapter will summarize the findings of the thesis and discusses its limitations and its broader implications finishing with possible future research options.

Chapter Five

Summary and Further Research

5.1 Introduction: Overview of the Thesis

Some wildlife species and certain types of wildlife habitat will likely not be provided at a socially optimal level today in south and central Saskatchewan's private farm lands. However, certain market mechanisms could potentially increase wildlife habitat for a range of species. However, as it was discovered during the farmer interview in certain areas of Saskatchewan white-tailed deer, a key game species is perceived by certain farmers as overabundant and are at times viewed as pests. In spite of the seemingly overabundance of white-tailed deer, game species are the logical objective of a market-based mechanism as they represent an asset that is readily marketable.

There have been a few causes identified that seem to account for the misallocation of wildlife habitat. Current property right distribution of wildlife and wildlife habitat are not helpful in motivating farmers to invest in more wildlife habitat. Valuation of wildlife and wildlife habitat does not take into consideration the positive externality produced by Saskatchewan farmers.

The thesis used a theoretical model to show that by assigning property rights of wildlife and wildlife habitat to private farmers made it possible to introduce a market mechanism, consequently the farmers accounting of land allocation of wildlife habitat shifted toward a mix that was more socially optimal. With the introduction of market mechanisms, farmers would receive private benefits by selling wildlife access and wildlife habitat related services, such as recreational hunting leases, thereby benefiting from hunters' use values.

The sale of access leases to recreational hunters in Saskatchewan represents a market mechanism that has been used in a number of jurisdictions outside of Canada but has not been used in Saskatchewan. This research provides information to help understand the potential for lease hunting in Saskatchewan. Based on the economics of land allocation and the conceptual framework used to explain the role of lease hunting it is possible that the introduction of lease hunting will increase the abundance of wildlife habitat, and particularly for the important games species such as white-tailed deer.

Looking at the introduction of lease hunting in rural Saskatchewan from the farmers' perspective, I can consider lease hunting as a mode of diversification where farmers can modestly decrease business risk by diversifying their business venture. Southern and central Saskatchewan farmers are evenly split on the topic of introducing hunting leases on private land. Some subgroups of farmers however have relatively distinct attitudes towards lease hunting.

5.2 Discussion of important findings

The strongest supporters of hunting leases are farmers that are actively involved in agricultural production on their land with an important indicator of this group of farmers being those who rent large areas of land. It is notable that everyone surveyed who rents, over and above owned land, more than 518 ha (1,280 ac) supports the introduction of recreational lease hunting without exception. Also the results indicate that people who allowed hunting on their land are more likely to support the introduction of lease hunting. Those who had been asked permission from recreational hunters to hunt on their land during the 2008 hunting season were less likely to support the introduction of lease hunting. Interestingly however demographic variables, such as age, and education did not have a significant effect on the respondents' attitudes towards the proposed lease hunting.

The WTA for a hypothetical lease hunting contract also has been estimated. Among farmers who support lease hunting, the average WTA for one day of hunting access was estimated to be just over $90, while the combined average of all the respondents irrespective of supportiveness was $110. The results from the tobit regression to determine which factors had the greatest influence on the WTA for a day of hunting lease showed that the perceived abundance of wildlife and wildlife habitat increased the WTA.

The variables that have the most influence on Saskatchewan farmers' attitudes toward lease hunting were identified as greater areas of rented land, those farmers who allowed hunting during the 2008 hunting season, and those who thought that they have too much mule deer on their land. These farmers were more likely to support the introduction of lease hunting. Meanwhile being asked for permission to hunt on their land by recreational hunters during the 2008 hunting season decreased the probability that such farmers would support the introduction of lease hunting.

Finally, the outfitter interviews found that Saskatchewan outfitters are strongly against the proposition of introducing lease hunting, mainly because they think that such policy change would bring on a significant unregulated competition to established outfitters. In the outfitters view a farmer that has the right to sell hunting leases becomes a semi-outfitter. Outfitters also communicated that illegal lease hunting is present in rural Saskatchewan and 30% of the interviewed outfitters mentioned that at times farmers charge outfitters money or other types of compensation so they can access farmers' land with their hunting clients.

5.3 Broader implications of the thesis

The idea of introducing lease hunting in Saskatchewan seems to resonate best with those farmers who find it important to have more control over hunters on their land. The farmer survey suggest that the importance of written contract between hunter and farmer is primary, confirming the literature from similar research in the U.S. which indicates that the written contract seems to be the strongest reason to introduce lease hunting. The additional income that would come with a lease hunting venture does not seem to be very important for farmers that would favour the introduction of lease hunting.

The question of government supported wildlife damage compensation is a complex one. Some might argue for discontinuing crop damage payments for farmers who derive benefit from wildlife residing on their land. Others may argue as farmers take on a greater share of providing a public good (wildlife habitat) they should still be eligible for crop damage compensation even though they benefit from the increased wildlife abundance. The estimated value of recreational hunting leases within the study regions for a three week white-tailed deer rifle season - From November 15 to December 7 - was approximately $4 million. By way of comparison, or to provide context, in 2008 the Federal Government paid out $9.5 million to farmers for wildlife damage compensation program for the entire province. It can be safely stated that by introducing lease hunting the federal government could save some portion of the wildlife damage payment on those farmers who choose to introduce lease hunting as they may generate more income from selling hunting leases than passively collecting wildlife damage payments. It also has to be noted that those farmers who would refuse to charge money to hunters would be still eligible to wildlife damage payments from the government.

One effect of the introduction of lease hunting is that there would be less investment required for monitoring from wildlife officers to enforce the prohibition of lease hunting as it would become legal. In addition, if the farmers were receiving benefits from the hunter access they would likely be willing to invest in monitoring and enforcement of hunter activity. This would potentially save money for the government. The only identifiable losers are the local recreational hunters that would need to pay more for the same activity. However, there might be the potential benefit if fewer farmers were to post their land against hunting therefore providing more options for the local recreationalist. There would also be potential improvement of hunting related services provided by farmers to paying recreational hunter customers. More importantly the quality and availability of huntable game would increase due to, for example, the incentive to farmers to feed wildlife during difficult winters and provide more habitat and shelter.

As a final point, free hunting was a very important consequence of the French Revolution and was the foundation of the New World. Taking away the right to free hunting should not be a decision that is taken lightly. Doing so, as seen in Europe and parts of the U.S. where public lands are scares, essentially redistributes wealth from common to private property. It is in essence a privatization with very clear winners and hunting would have the potential, over the long term, to become an elitist activity again, as before the French revolution.

5.4 Study limitations

Limited resources were available to conduct this research and the study was therefore limited to certain regions of the Province of Saskatchewan. If time and money would have permitted, it would have been helpful to conduct representative sampling among all Saskatchewan farmers including all regions not just the preselected three: Biggar, Eston, and Esterhazy. If greater resources had been available I would have certainly altered sampling,

sample size, broadened the scope of the sample to include more outfitter and wildlife professionals and altered the survey. I would also have asked more similar questions regarding lease hunting attributes of the supporters and failed to support groups to make analysis of the two more comparable.

5.4 Further Research

In this thesis I am not dealing with the long-term effects of hunting popularity and its apparent decline due to changing demographics (eg. increasingly urban populations) and threats such as increasing wildlife diseases such as Chronic Wasting Disease (CWD) in wild ungulate populations. It would be interesting to see how wildlife management changes as a result of lost revenue from the decreasing hunting population and increased interest in the non-consumptive use of wildlife. From another point view if recreational hunting gets marginalized and lease hunting have not been introduced yet at the time, then opposition probably would not be high as less people would care about the well-being of the remaining recreational hunters.

In this research the perception of Saskatchewan farmers on lease hunting was covered; however, it would be also valuable to know what the rest of the Saskatchewan population thinks about the issue. I would propose a general survey or referendum to ask Saskatchewanians over 18 about the introduction of lease hunting.

Since in the current thesis the estimation of the demand side was based on the query of the northern outfitters that are mainly operating on crown land in the northern part of province on typically forested region, to estimate more precisely the economic value of recreational I think it is advisable to conduct a survey among resident Saskatchewan hunters to measure or estimate as best as possible their WTP for a hunting lease. To measure non-Canadian big-game hunters'

WTP is not necessary since hunting for non-Canadian hunters for big game is legally not allowed in the farming region, even with the help of an outfitter. However a subgroup of non-Canadian hunters, bird hunters that is, could be an interesting source of WTP survey.

Saskatchewan's crop damage compensation program creates incentives, which have several consequences. From one side it provides an incentive to tolerate wild animals on the farmland, and at the same time create hunting opportunities. On the other hand abolishing the program might induce hunting, at least in the short run, since farmers might be more motivated than without the compensation program to have someone to shoot the damage causing animals. The lack of a compensation program might create hunting opportunities only in the short run as the increased hunting pressure combined with other animal control measures may end up with a drastically decreased wildlife population.

When a farmer is investing into wildlife habitat to make their land more attractive to hunters, they may invest more money to encourage certain type of animals and discourage others. That is, the incentive provided by lease hunting will encourage to provision of habitat for quality white-tailed deer and mule deer bucks (and other ungulates) but would discourage the presence of other animals that may compete or conflict with game animals. The research question might be focused on understanding how a lease hunting institutions would affect the landscape in the event that selective wildlife habitat improvement would be introduced?

If it is possible, I would augment the current farmer survey conducted by Statistics Canada with some lease hunting related question so interested parties could follow up on the evolution of attitudes toward lease hunting among SK farmers.

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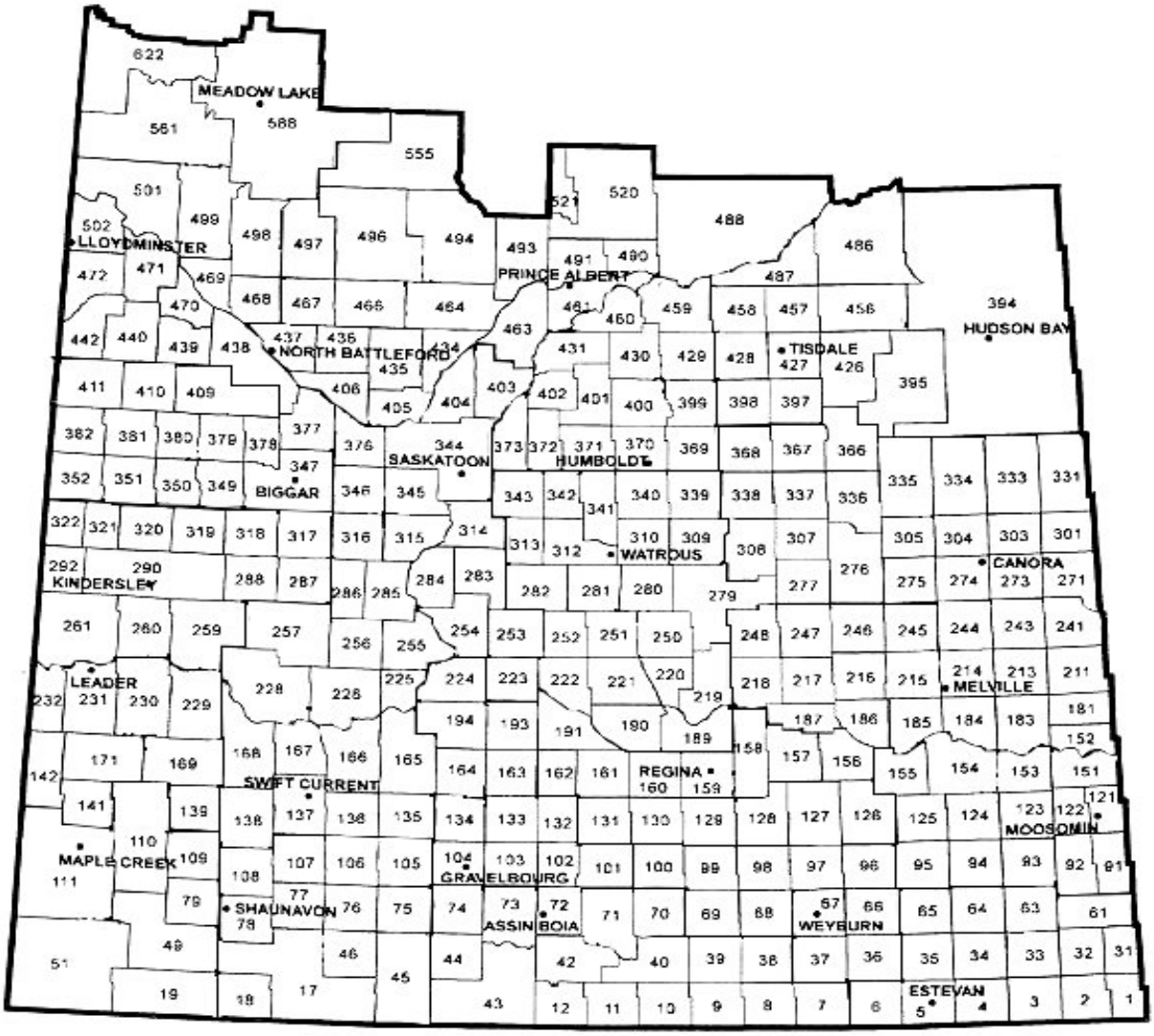
Appendix 1

Farmer survey questionnaire

Filter 1/ Are you a farmer in Saskatchewan?

Filter 2/ Please place an X on the map[33] below where your farm is approximately located.



I. Opinion about hunting

- Q1 How would you rate the quality of wildlife habitat on your farmland from 0 to 9, where 0 means non-existent and 9 means could not be any richer.

[33] From: http://www.rootsweb.ancestry.com/~cancemet/SK/Map-SKRM.jpg

0	1	2	3	4	5	6	7	8	9

If you choose 0(non-existent wildlife) ->Please proceed to Q2, otherwise Q1a

Q1a: Please indicate whether you have any of the following species on your farmland:

White-tailed deer

Yes	No

If YES please rate the abundance:

0	1	2	3	4	5	6	7	8	9

Do you consider White-tailed deer population too high?

Yes	No

Mule deer:

Yes	No

If YES please rate the abundance:

0	1	2	3	4	5	6	7	8	9

Do you consider Mule deer population too high?

Yes	No

Ducks, Geese:

Yes	No

If YES please rate the abundance:

0	1	2	3	4	5	6	7	8	9

Upland game birds:

Yes	No

If YES please rate the

0	1	2	3	4	5	6	7	8	9

abundance:

Moose:

0	1	2	3	4	5	6	7	8	9

Yes	No

If YES please rate the abundance:

Elk:

0	1	2	3	4	5	6	7	8	9

Yes	No

If YES please rate the abundance:

Other game animals:

Yes	No

If YES please rate the abundance, and specify:

0	1	2	3	4	5	6	7	8	9

Q2Have you ever restricted hunting on your farmland?

Yes	Please proceed to Q2a
No	Please Proceed to Q3

Q2a. Does any portion of your land is posted, with respect to hunting

Yes	No

restrictions?

Posted for "*No Hunting*" [in % of total farmland]:

Posted for "*Hunting on foot only"* [in % of total farmland]:

Posted for "*Hunting with permission only"* [in % of total farmland]:

Posted for any other types of hunting restrictions? If yes please specify!

Q3 Did anyone asked for permission to hunt on your land during the 2008 fall hunting season?

	Yes
	NO

Q4 Did you allow hunting on your farmland during 2008 fall hunting season?

	Yes=> Please proceed to Q4a
	No=> Please proceed to Q7

Q4a Have you ever had any problem with hunters?

Q5 Did you pose any restrictions on who can hunt on your land?

	Yes=> Please proceed to Q6
	No=> Please proceed to Q8a

Q6. Who was excluded from hunting on your farmland?

Please proceed to Q8a

Q7. Have you ever allowed hunting on your farmland?

	Yes=> Please continue on Q4a
	NO=>Please continue on Q11

Q8a Have you ever provided services to hunters and or outfitters?

Q8/ If you had an option to charge money to hunters to access your land for hunting would you consider it?

	Yes=> Please continue on Q9
	NO=>Please continue on Q10a

Q9[34]/ What would be the most important features (concerns) if you were considering charging money to hunters in exchange for hunting access to your land: please choose between 1 and 10, where 1 means not important at all and 10 means the most important feature.

This question was inspired by the following paper: Anwar Hussain, I., A., et al. Factors Influencing Lease Revenue and Non-Industrial Farmers' Willingness to Allow Hunting Access. 2005.05.13. *Selected Paper prepared for presentation at the American Agricultural Economics AssociationAnnual Meeting, Providence, Rhode Island, July 24-27, 2005*

[34]

Q9a/ How important the income component would be if you were generating revenue from providing hunting access to hunters.

1	2	3	4	5	6	7	8	9	10

Q9b/ When people are hunting they behave differently how important would be for you to have control over who can hunt on your land?

1	2	3	4	5	6	7	8	9	10

Q9c/ Enforcing the rules of a hunting access operation could be costly and sometimes dangerous. How important would be for you to keep the administration and monitoring cost at a low level?

1	2	3	4	5	6	7	8	9	10

Q9e/Accidents are a fact of life. Being covered against liability issues is important. How important would that be for you in the event that you would start you hunting access operation?

1	2	3	4	5	6	7	8	9	10

Q9f/ How concerned would you be about you and your family personal safety?

1	2	3	4	5	6	7	8	9	10

Q9g/How concern would you be if you were start your hunting access operation about the damage hunters might cause in your personal property: fence, building, road, etc.

1	2	3	4	5	6	7	8	9	10

Q9h/ How concern would you be if you were start your hunting access operation about the damage hunters might cause in your crop?

1	2	3	4	5	6	7	8	9	10

Q9i/ How concern would you be if you were start your hunting access operation about the noise pollution hunters might cause?

1	2	3	4	5	6	7	8	9	10

Q9j Which agency or organization would you prefer as a facilitator of hunting lease business? Please ask me for clarification if any of the below options are unfamiliar to you.

	An outfitter company	
	Farmer-Hunter co-op	
	Farmer co-op	
	Government agency	
	Hunting organization	
	Self administration	
	Else: please specify	

II./ Background information1

D1/Age group:

	Under 35
	35-50
	50-65
	Over 65

D2/ Gender:

	Male
	Female

D3/ Highest Education:

	Less than grade 12
	Grade 12
	Some post secondary education
	Post secondary degree or diploma (Bachelors degree or 16 years of education)
	Post graduate degree (more than 16 years of schooling)

D4/ How much farmland do you own? (In acres)

D4/a How much of it is uncultivated?

D4/b How much of it is annually seeded?

D4/c How much land do you rent, and how much of it is under cultivation?

D5/ Do you live at your farm for more than 6 month per year?

	Yes	
	No=> If not => How far away is your permanent address from your farm. (in kilometres)	kms

D6/ Are you a hunter?

Yes	No

If yes did you go hunting in the last 12month?

Yes	No

Optional questions (depending on previous answers):

Q9ki If you were allowed to charge hunters for access, what do you think how much money would be fair for a day of access?

Q9kii If you were allowed to charge hunters for access, what do you think would be fair charge for a week of access?

Q9kiii If you were allowed to charge hunters for access, what do you think would be fair charge for a year of access?

Here is the end of your survey, thank you very much for your time.

Q10a/ Do you believe that hunting is a basic right and you wouldn't want to violate that right. Please choose between 1 and 10, where 1 means not important at all and 10 means the most important feature when considering your decision

.

1	2	3	4	5	6	7	8	9	10

If answer is 10 go to background information 1.

Q10b/ Too much time and money when administering such option.

1	2	3	4	5	6	7	8	9	10

Q10c/ I am afraid of liability issues.

1	2	3	4	5	6	7	8	9	10

Q10d/ I am concerned with the enforcement of the hunting rules. i.e. (physical danger)

1	2	3	4	5	6	7	8	9	10

III./ Background information1

D1/Age group:

	Under 35
	35-50
	50-65
	Over 65

D2/ Gender:

	Male
	Female

D3/ Highest Education:

	Less than grade 12
	Grade 12
	Some post secondary education
	Post secondary degree or diploma (Bachelors degree or 16 years of education)
	Post graduate degree (more than 16 years of schooling)

D4/ How much farmland do you own? (In acres)

4/a How much of it is uncultivated?

4/b How much of it is annually seeded?

4/c How much land do you rent, and how much of it is under cultivation?

D5/ Do you live at your farm for more than 6 month per year?

	Yes	
	No=> If not => How far away is your permanent address from your farm. (in kilometres)	kms

Here is the end of your survey, thank you very much for your time.

Q11. If you currently do not allow hunting on your land, what are the main reasons? Please indicate how you feel about the following attributes in a scale of 1 to 10 where 1 means that the given factor is not part of the decision of not allowing hunting and 10 means it is a very important factor when deciding to not allow hunters on your farm land.

Q11a/ I am ethically against hunting and do not support any kind of hunting.

1	2	3	4	5	6	7	8	9	10

If answer is 8, 9 or 10 proceed to Q12

If answer is 7 or lower proceed to Q8.

Q12 (Q4a) Have you ever had any problem with hunters?

Please proceed to background information 1

Appendix 2

Consent Form

Student Researcher: Mr. Ákos Krasznai Phone: (306) 966-4039

You are invited to participate in a research project entitled *Value of Recreation Leases in Rural Saskatchewan.* Please read this form carefully, and feel free to ask questions that you might have.

Purpose and Procedure: The purpose of the study is to measure Saskatchewan farmer's opinions and willingness to participate in selling land access leases to recreational hunters, to Identify farmer specific recreational lease attributes that are crucial to farmer support. We are asking that participants fill out a survey as truthfully as possible. The estimated time to complete the survey is fifteen minutes.

Potential Benefits: Your participation will increase the understanding around the benefits and costs of recreational leases and the appropriateness of recreational leases for the province of Saskatchewan.

Potential Risks: There are no known risks associated with participating in the survey. All data will be stored in a safe and secure manner and all information will be confidential.

Storage of Data: The researcher will store all data collected in a safe and secure manner at the Department of Bioresource Policy, Business and Economics for a period of five years. The data will be destroyed, after at least 5 years, when it is no longer required.

Confidentiality: The research conclusions will be published in a variety of formats, both print and electronic. These materials may be further used for purposes of conference presentations, or publication in academic journals, books or popular press. In these publications, the data will be reported in a manner that protects confidentiality and the anonymity of participants. The

information provided by survey participants will be used and presented in aggregate without individual responses being reported.

Right to Withdraw: Your participation is voluntary, and you can answer only those questions that you are comfortable with. The information that is shared will be held in strict confidence and discussed only with the research team. You may withdraw from the research project for any reason, at any time, without penalty of any sort. If you withdraw from the research project at any time, any data that you have contributed will be destroyed at your request.

Questions: If you have any questions concerning the research project, please feel free to ask at any point; you are also free to contact the researchers at the numbers provided if you have other questions. This research project has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on (date:). Any questions regarding your rights as a participant may be addressed through the Ethics Office (966-2084). Out of town participants may call collect.

Consent to Participate:

I have read and understood the description provided; I have had an opportunity to ask questions and my/our questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records.

_____ _____

(Signature of Participant) (Date)

_____ _____

(Signature of Researcher) (Date)

Appendix 3

Interview Guide with outfitters:

1. Do you think it is a good idea to introduce recreation leases in rural Saskatchewan?

2. If they were an opportunity to lease private land from Saskatchewan farmers to extend your outfitting operation would you consider it?

3. How would you describe your relationship with private land owners when conducting your outfitter business?

4. How would influence your business operation if you had an opportunity to extend your business to the Southern part of Saskatchewan with foreign hunter participation?

5. What do you think about the reaction of local hunters after the introduction of recreation leases?

6. If they were a referendum about introducing recreational leases in rural Saskatchewan would you vote for it?

Questions that were actually asked during the telephone interview process:

1. What area of the province does your outfitting business primarily operate in and what are the primary game animals your clients focus on.
2. Where do most of your clients come from – Canada (SK), Canada (other provinces), U.S., Europe, Other?

3. In your hunting outfitter business do you have to deal with private farmers

   Yes No

4. a/ If Yes=>What is the purpose of this relationship? Get access to land, to provide other services (dressing or game, accommodation etc.).

   b/ How many separate farmers do you have relationship with?

   c/ How long your relationship is going on with private farmers?

5. Do land owners charge money for the provisions of their services, or ask for favours, maybe some other kind of compensation they request?
6. Have you been refused access to private land? How often (or what proportion of the farmers refuse outfitters access)?
7. If there was an opportunity to lease private land from Saskatchewan farmers to expand your outfitting operation would you consider it?
8. Do you think it is a good idea to introduce recreation leases (aka fee hunting) in rural Saskatchewan? Explain reasons?
9. What would you be willing to pay to access agricultural land for the purpose of your outfitting business (big game? Waterfowl? Upland game birds?)
10. Do you think there would be resistance to recreational leases in Saskatchewan?

    SK resident .

11. Which agency or organization would you prefer as a facilitator of a hunting lease business?

    Outfitter

    Farmer Co-op

    Farmer-Hunter Co-op

    Government Agency

    Hunting Organization (SWF)

    Individual farmer administered

Appendix 4

Statistical calculations and econometric outputs

4.1

In order to be able to compare the demographical data with that of the 2006 Saskatchewan census of agriculture data, I adjusted the sample data the following way: assumed uniform distribution in the age group 35 to 50 and in age group 50 to 65. I extended the age group between 35 and 50 to between 35 and 55, by extrapolating the sample data assuming uniform distribution. In a similar way I reduced the sample age group between 50 and 65 to between 55 and 65, assuming uniform distribution, and added the over 65 years age group, resulting in an agricultural census conform age bracket: over 55 years.

4.2

Example of testing for differences between census and sample data at the under 35 years old age group:

H_0=Sample average does not differ from 2006 Census of agriculture average

H_1=Not H_0

$$t = \left|\frac{x-\bar{x}}{\frac{s}{\sqrt{n}}}\right| = \left|\frac{10.71-10.1}{\frac{31.12}{\sqrt{84}}}\right| = 0.18$$

Fail to reject H_0 at any standard statistical significance level

4.3

H_0=Sample average does not differ from 2006 Census of agriculture average

H_1=Not H_0. $t = \left|\frac{x-\bar{x}}{\frac{s}{\sqrt{n}}}\right| = \left|\frac{1553.42-1450}{\frac{1637.49}{\sqrt{84}}}\right| = 0.5788$

Fail to reject H_0 at any standard statistical significance level.

4.4

Comparison of general Saskatchewan population with sample in terms of high school education:

H_0=Sample average does not differ from 2006 Saskatchewan Census average

H_1=Not H_0.

$$t = \left|\frac{x-\bar{x}}{\frac{s}{\sqrt{n}}}\right| = \left|\frac{21.43-29.56}{\frac{41.28}{\sqrt{84}}}\right| = 1.805$$

Reject H_0 at the 10% significance level, means that more Saskatchewan residents have high school as a highest level of attained education than Saskatchewan farmer.

4.5

Comparison of general Saskatchewan population with sample in terms of highest attained education level at the minimum bachelor level:

H0=Sample average does not differ from 2006 Saskatchewan Census average

Ha=Not H0.

$$t = \left|\frac{x-\bar{x}}{\frac{s}{\sqrt{n}}}\right| = \left|\frac{23.81-15.9}{\frac{42.85}{\sqrt{84}}}\right| = 1.692$$

Reject H0 at the 10% significance level, means that less Saskatchewan residents have minimum a bachelor degree as a highest level of attained education than Saskatchewan farmer.

4.6

Using normal approximation of binomial distribution:

H_0: π=1/2, Farmers sampled in the age group 35 to 50 are equally likely to support fee hunting than to oppose it

H_1: π>1/2, where π represents the probability that a farmer in the age group 35 to 50 will support the introduction of lease hunting

$$z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}} = 1.347$$

Reject H_0 not at the 10% level.

4.7

$$t = \left| \frac{x - \bar{x}}{\frac{s}{\sqrt{n}}} \right| = \left| \frac{546.29 - 151.31}{\frac{306.25}{\sqrt{38}}} \right| = 7.95$$

4.8

$$H_0 : \mu_1 - \mu_2 = 0$$

H_a: $\mu_1 - \mu_2 > 0$

$$t_{66} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\left(\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2) - 2}}\right)\left(\frac{n_1 + n_2}{n_1 n_2}\right)} = 1.66$$

$$t_{66,10=1.29}$$

92.68% permission rate among 'Supporters' is significantly greater than the 'Against' group's 78.95% permission rate at the 10% significance level.

Appendix 5

Raw Data from farmer survey

Explication of headings:

RM: Rural Municipality Number;

Q1: How would you rate the quality of wildlife habitat on your farmland from 0 to 9, where 0 means non-existent and 9 means could not be any richer.

Q2: Abundance of white-tailed deer [0;9]

2manyWT: Do you consider white-tailed deer population too high? Yes=1, No=0.

Q3: Abundance of Mule deer [0;9]

2manyM: Do you consider mule deer population too high? Yes=1; No=0

Q4: Abundance of geese: [0;9].

RH: Have you ever restricted hunting on your farmland? Yes=1; No=0

NH: What portion of your land is posted with the sign "No Hunting?"[0 to 1]

ID	RM	Q1	Q2	2manyWT	Q3	2manyM	Q4	RH	NH
1	347	8	2	0	7	0	4	0	0
2	347	8	9	1	9	1	9	0	0
3	347	9	9	1	9	1	9	1	0.333333
4	347	4	5	1	5	1	6.5	1	0
5	347	9	8	1	1	0	9	1	1
6	347	7	4	1	7	1	2.5	1	0
7	347	6	3	0	3	0	4	1	1
8	346	7	6	0	6	0	2.5	1	1
9	437	9	7.5	0	9	0	6	1	0
10	438	7	9	1	3	0	9	0	0
11	470	9	1	1	0	0	9	0	0
12	468	9	8	1	8	1	8	1	0
13	437	6.5	7	1	6	1	9	1	0.5
14	377	9	9	1	0	0	5.5	0	0
15	438	9	9	1	9	1	0	0	0
16	409	7	7	0	4	0	6	1	0
17	379	8	3	0	8	1	6	0	0
20	347	3	7	1	7	1	5	0	0
21	347	8	9	1	9	1	0	1	0.5
23	259	8	3	0	0	0	4	1	0
24	259	0	0	0	2	0	4	0	0
25	259	5	1	0	1	0	5	0	0

26	228	5	0	0	4	0	9	0	0
27	228	9	2.5	0	2.5	0	9	0	0
28	228	5	1	0	5	1	8	1	0
29	228	6	2	0	6	1	6	0	0
30	228	3	5	0	7	0	4	0	0
31	228	4	2	0	0	0	0	1	0
32	228	5	6	1	3	0	4	0	0
33	228	0	0	0	0	0	2	0	0
34	228	7	5	0	4.5	0	7	1	0
35	228	4	2	0	6	0	2	0	0
36	259	5	4	0	7	1	8	0	0
37	228	5	2	0	2	0	9	0	0
38	153	6	5	0	0	0	3	1	1
39	123	4.5	5.5	0	0	0	3	0	0
40	183	7.5	5	1	0	0	9	0	0
41	183	7	7	1	0	0	6	1	1
42	183	9	8	1	1	1	7	1	0
43	183	9	9	1	0	0	4.5	0	0
44	183	8	6	1	6	1	7	0	0
45	183	8	9	1	1	0	8	0	0
46	183	9	9	1	1	0	7	0	0
47	183	7	7	1	7	1	6	1	0
48	183	7	8	0	0	0	7	0	0
49	153	7	8	0	0	0	6	1	0
50	183	7	9	1	0	0	4	0	0
51	183	3	3	0	0	0	3	0	0
52	183	6	5	1	0	0	5	0	0
53	183	5	6	1	2	1	3.5	1	0.5
54	183	7	7	1	0	0	3	0	0
55	183	9	9	1	0	0	4	0	0
56	183	9	9	1	1	0	7	0	0
57	183	7.5	9	1	4	0	6	1	0.1
58	183	7	8	1	0	0	2	1	0
59	183	9	9	1	0	0	9	1	0.2
60	183	6	7	1	0	0	3	1	1
61	183	7	9	1	3.5	0	3	0	0
62	153	9	7	0	0	0	9	0	0
63	183	6	8	1	0	0	8	0	0
64	183	7	9	1	0	0	8	0	0
65	183	5	5	1	0	0	7	0	0
66	153	6.5	9	1	1.5	0	2.5	0	0.285714
67	183	9	9	0	3	0	7	1	0.5
68	121	6	9	1	0	0	7	0	0

69	121	9	6	0	0	0	6	0	0
70	121	6	7	0	0	0	5	1	0
71	121	6	4	0	0	0	5	1	0.5
72	121	3	2	0	0	0	7.5	1	1
73	122	4	3	0	0	0	3.5	1	0
74	121	8	7	1	0.5	0	6.5	0	0
75	121	5	5	0	0	0	7	1	1
76	121	9	5	1	1	0	9	1	0
77	121	4	9	1	2	0	7	1	0
78	121	7.5	3.5	0	0	0	5.5	0	0
79	93	8	9	0	0	0	8	1	1
80	93	7	5	1	0	0	6	1	0
81	93	9	7	1	0	0	5	1	0
82	93	5	5	0	1	0	9	1	0
83	93	7	8	1	0	0	7	1	0
84	93	4	6	1	1	0	5	1	0.333
85	93	7.5	5	0	0	0	3	1	0
86	93	8	7	0	0	0	8	1	0
87	93	7	7	1	0	0	7	1	0.5

Explication of headings:

HF: What portion of your land is posted with the sign “Hunting on foot only?” [0;1]

HP: What portion of your land is posted with the sign “Hunting with permission only?” [0;1]

2008HP: Did anyone ask for permission to hunt on your land during the 2008 fall hunting season. Yes=1; No=0

2008AH: Did you allow hunting on your farmland during the 2008 fall hunting season? Yes=1, No =0

ProbH: Have you ever had problem with hunters? Yes=1 No=0.

Exclusion: Who was excluded from hunting on your farmland? 0=Nobody; 1=Strangers; 2=Americans; 3=First Nations; 4=Outfitters; 5=everybody

Service: Have you ever provided services to hunters and or outfitters, ex: guiding, providing shelter to hunters, digging pits, cooking, etc.? Yes=1; No=0.

Y: If you had an option to charge hunters to access your land for hunting would you consider it? Yes=1; No=0.

Hincome: How important the income component would be if you were genereatig revenue from providing hunting access to hunters [0;9] where 0=not important at all and 9=the most important attribute ever. (This is from survey question 9a.)

ID	HF	HP	2008HP	2008AH	ProbH	Exclusion	Service	Y	Hincome
1	0		0	1	0	0	0	0	
2	0	0	1	1	1	0	0	1	10
3	0	0	1	1	1	0	0	1	8
4	0	0	1	1	0	1	0	0	
5	0	0	0	0	1	1	0	Maybe	
6	0	0	1	1	0	0	0	0	
7	0	0	1	1	0	0	0	1	3
8	0	0	1	0	0	0	0	0	
9	0	0.20	1	1	1	1	0	1	3
10	0	0	1	1	1	0	1	1	7
11	0	0	1	1	0	0	0	1	1
12	0	0	1	1	0	1	0	1	3
13	0	0	1	1	1	4	0	1	2.5
14	0	0	1	1	0	0	0	1	7.5
15	0	0	1	1	0	0	0	0	
16	0	0	1	1	1	1	1	0	
17	0	0	1	1	0	0	0	0	
20	0	0	1	1	1	0	0	0	
21	0	1	1	1	1	0	0	1	5
23	0	0	1	1	1	0	1	0	
24	0	0	1	1	0	0	0	0	
25	0	0	0	1	0	0	1	0	
26	0	0	1	1	0	0	0	1	10
27	0	0	1	1	0	0	0	0	1
28	0	0	1	1	1	4	1	1	1
29	0	0	1	1	1	1	0	1	2.5
30	0	0	0	1	1	0	0	1	1.5
31	0	0	0	1	0	4	0	1	1
32	0	0	0	1	0	0	0	0	
33	0	0	1	1	1	0	0	1	1
34	0	1	1	1	1	4	0	0	
35	0	0	1	1	1	0	0	0	
36	0	0	1	1	0	0	0	1	1
37	0	0	1	1	0	0	0	0	
38	0	0	0	1	0	1	0	1	2
39	0	0	0	1	0	0	0	1	2
40	0	0	1	1	0	0	0	1	1

41	0	0	0	1	1	1	0	0	
42	0	0.5	1	1	1	1	0	0	
43	0	0	0	1	0	0	0	0	
44	0	0	1	1	1	0	0	1	8
45	0	0	0	0	0	0	0	0	
46	0	0.1	1	1	1	0	0	1	5
47	0	0	1	1	0	0	0	0	
48	0	0.3	0	0	0	0	0	Maybe	1
49	0	0.666667	1	1	0	3	0	1	4
50	0	0	1	1	1	0	0	0	
51	0	1	0	1	1	0	0	1	1
52	0	0	0	1	0	0	0	0	
53	0	0	1	1	0	0	0	1	3
54	0	0	1	1	0	0	0	0	
55	0	0	0	1	0	0	0	1	3
56	0	0	0	1	0	0	0	1	7
57	0	0	1	1	0	0	0	1	3
58	1	0	1	1	0	0	0	1	6
59	0	0	1	1	1	0	0	0	
60	0	0	0	0	0	0	0	1	2
61	0	0	1	1	0	0	0	0	
62	0	0	1	1	0	0	0	1	5
63	0	0	1	1	0	0	0	0	
64	0	0	1	1	0	0	0	0	
65	0	0	1	1	0	0	0	0	
66	0	0	1	1	1	0	0	1	9
67	0	0	0	1	1	0	0	1	1
68	0	0	1	0	0	0	0	1	1.5
69	0	0	1	1	0	0	0	1	1
70	0	1	1	1	0	1	0	1	1
71	0	0	0	0	0	0	0	0	
72	0	0	0	0	0	0	0	0	
73	0	0.66	0	0	0	1	0	1	6.5
74	0	0	1	1	0	0	1	0	
75	0	0	0	0	0	5	0	0	
76	0	1	1	1	0	1	0	Maybe	1
77	0	0.5	1	1	0	0	0	1	1
78	0	0	0	0	0	0	0	0	
79	0	0	1	0				0	
80	0	0.3	0	0	0	1	0	Maybe	2
81	0	0	1	1	0	0	0	0	
82	0	1	1	1	0	0	0	0	
83	1	0	1	1	0	0	0	1	2

84	0	0	0	1	1	0	0	1	5
85	0	0	1	1	0	0	0	Maybe	1.5
86	0	0.25	0	0	0	0	0	0	
87	0	0	1	1	0	0	0	1	2

Explication of headings:

Hcontrol: When people are hunting they behave differently. How important would be for you to have control over who can hunt on your land? [0;9] where 0=not important at all 9= the most important (from farmer survey question 9b)

Hlowcost: Enforcing the rues of a hunting access operation could be costly and sometimes dangerous. How important would be for you to keep the administration and monitoring cost at a low level? [0;9] where 0=not important at all. 9=the most important attribute. (from farmer survey question 9c)

Hinsurance: Accidents ara a fact of life. Being covered against liability issues is important. How important would that be for you in the event thatyou would start your hunting access operations? [0;9] where 0=not important at all and 9=the most important feature (From farmer survey question 9e)

Hsafety: How concerned would you be about you and your family's personal safety? ? [0;9] where 0=not important at all and 9=the most important feature (From farmer survey question 9f.)

Hproperty: How concerned would you be if you were starting your hunting access operation, about the damage hunters might cause to your personal property: fence, buildings, road, animals, etc.? [0;9] where 0=not important at all and 9=the most important feature (From farmer survey question 9g).

Hcrop: How concerned would you be if you were starting your haunting access operation, about the damage hunters might cause in your crop? [0;9] where 0=not important at all and 9=the most important feature (From farmer survey question 9h).

Hnoise: How concerned would you be if you were starting your hunting access operation, about the noise pollution hunters might cause? [0;9] where 0=not important at all and 9=the most important feature (From farmer survey question 9i).

Oo: Which organization or agency would you prefer as a facilitator of a hunting lease business? An outfitter company: Yes=1; No=0.

OFHcoop: Which organization or agency would you prefer as a facilitator of a hunting lease business? A Farmer-Hunter co-op: Yes=1; No=0

ID	Hcontrol	Hlowcost	Hinsuran	Hsafety	Hproperty	Hcrop	Hnoise	Oo	OFHcoop
1									
2	10	4	1	10	10	10	1	0	0

3	10	8	10	5	10	NA	5	1	0
4									
5									
6									
7	10	9	9	10	10	8	6	0	0
8									
9	10	10	10	10	9	9	1	1	1
10	10	10	10	10	10	10	10	0	0
11	10	10	10	5	1	10	3	1	1
12	9	6	10	10	10	9	9	0	1
13	10	5.5	10	10	9	10	10	0	1
14	1.5	9.5	10	2.5	9.5	9.5	6.5	1	1
15									
16									
17									
20									
21	10	10	10	10	10	10	1	0	0
23									
24									
25									
26	10	6	10	10	10	10	10	1	0
27	10	10	10	2	2	2	2	1	0
28	10	10	10	10	10	10	7	0	0
29	6.5	3	9	9	8	8	5	1	0
30	6	8	9	8	8	6	1	1	0
31	9	8	8	7	5	2	4	0	1
32									
33	10	10	10	10	10	10	5	0	0
34									
35									
36	10	10	10	10	10	10	8	0	0
37									
38	9	9	9	5	6	8	3	1	1
39	1	1	10	10	10	10	6	0	0
40	4	2	8.5	10	9	10	6	0	1
41									
42									
43									
44	10	6	10	10			2	0	0
45									
46	10	6	1	10	2	1	1	0	0
47									
48	6	8	8	8	7	6	3	0	1

49	9	8	9	9	8	3	2	0	0
50									
51	10	10	10	10	10	10	10	0	0
52									
53	8	5	2	10	10	10	3	0	1
54									
55	7	8.5	8.5	3.5	3.5	5	4	0	0
56	10	9	9	1	6	10	1	0	1
57	9.5	6	9.5	8	7	6	1.5	1	0
58	10	10	9.5	5	9	7.5	1.5	0	1
59									
60	10	5	10	10	10	10	6	0	1
61									
62	3	7	10	1	1	2.5	1	1	0
63									
64									
65									
66	10	5	10	10	10	10	10	0	1
67	10	5	10	10	10	n.a.	1	1	1
68	9.5	7.5	10	10	10	2	2.5	0	0
69	10	10	7	2.5	10	10	3	0	0
70	10	10	10	10	10	10	2	0	0
71									
72									
73	10	8	10	10	10	10	7	0	0
74									
75									
76	10	10	10	10	10	10	10	0	0
77	5	5	8	10	7	8	5	0	0
78									
79									
80	10	10	10	10	10	10	5	0	0
81									
82									
83	10	9	10	5	8	10	5	0	0
84	10	8	8	8	6	7	2	0	0
85	10	10	10	1.5	9	9	2	0	0
86									
87	6	7	8	8	8	6	3	0	0

Explanation of headings.

Ofcoop: Which organization or agency would you prefer as a facilitator of a hunting lease business? Farmer coop? Yes=1; No=0 (Farmer survey 9j)

Ogov: Which organization or agency would you prefer as a facilitator of a hunting lease business? A government agency? Yes=1; No=0 (Farmer survey 9j)

Oho: Which organization or agency would you prefer as a facilitator of a hunting lease business? A hunting organization similar to SWF? Yes=1; No=0 (Farmer survey 9j)

Oselfad: Which organization or agency would you prefer as a facilitator of a hunting lease business? Self administration? Yes=1; No=0 (Farmer survey 9j)

HbasicRig: Do you believe that hunting is a basic right and you wouldn't want to violate that right. Please choose between 1 and 10, where 1 means totally disagree and 10 is totally agree. (Farmer survey 10a)

H2mucht: It would be too much time and money when administering a fee hunting operation. [1;10] the higher the number the stronger you agree.

Hliability: I am afraid of liability issues [1;10]] the higher the number the stronger you agree.

Henforce: I am concerned with the enforcement of the hunting rules (i.e. physical danger) [1;10]] the higher the number the stronger you agree. (Farmer Survey 10d.)

Hethic: I am ethically against hunting and do not support any kind of hunting. [1;10] higher the number the stronger you agree (Farmer Survey 11a).

ID	Ofcoop	Ogov	Oho	Oselfad	HbasicRig	H2mucht	Hliability	Henforc	Hethic
1					2	1	2	1.5	
2	0	0	0	0					
3	0	0	0	0					
4					n/a	n/a	n/a	n/a	
5									
6					n/a	3	10	8	
7	1	0	0	0					
8					1	10	8	10	
9	1	0	1	0					
10	0	0	0	1					
11	1	1	1	1					
12	0	0	0	0					
13	1	0	0	1					
14	0	0	0	0					
15					10	n/a	n/a	n/a	
16					8	n.a	n/a	n/a	
17					8	5	7	7	

20					8	2	10	10
21	0	0	0	1				
23					7	10	9	9.5
24					9.5	n/a	n/a	n/a
25					8	8	5	5
26	0	0	0	0				
27	0	0	0	0	n/a	n/a	n/a	n/a
28	0	0	0	1				
29	0	0	0	1				
30	0	0	0	1				
31	1	1	1	0				
32					10	n/a	n/a	n/a
33	0	0	0	1				
34						n/a	n/a	n/a
35					1	n/a	n/a	n/a
36	0	0	0	1				
37					5	n/a	n/a	n/a
38	0	0	0	0				
39	0	0	1	0				
40	0	0	1	0				
41					10	n/n	n/a	n/a
42					2	9	10	10
43					10	n/a	n/a	n/a
44	1	0	0	0				
45					4	8	n/a	n/a
46	0	0	0	1				
47					10	n/a	n/a	n/a
48	0	0	1	0				
49	0	0	1	0				
50					10	n/a	n/a	n/a
51	0	0	0	1				
52					3	1	8	8
53	0	0	0	1				
54					10	n/a	n/a	n/a
55	0	0	1	1				
56	1	0	1	0				
57	0	0	0	1				
58	0	0	0	0				
59					9	n/a	n/a	n/a
60	0	0	1	0				
61					10	n/a	n/a	n/a
62	0	0	0	1				
63					8	10	10	9

64					1	n/a	n/a	n/a	
65					8	n/a	n/a	n/a	
66	0	1	0	0					
67	1	1	1	0					
68	0	0	1	0					
69	0	0	0	1					
70	0	1	0	0					
71									2
72									1
73	0	0	0	1					
74					2	7	3	3	
75									
76	0	0	0	1					
77	0	1	0	0					
78					8.5	5.5	3.5	8	
79									10
80	0	0	1	0					
81					1	10	10	10	
82					8				
83	0	1	0	0					
84	0	0	1	1					
85	0	0	0	1					
86					10				
87	0	0	1	0					

Explication of headings:

Age groups: A1=under 35; A2=[35;50]; A3=[50;65]; defaultage65=over65

Highest Education: E1=less than grade 12; E2= some post secondary education; E3=Post secondary degree or diploma (Bachelor or at least 16 yrs of education); default educ=grade12.

ID	A1	A2	A3	default age65	E1	E2	E3	defaulteduc
1	0	1	0	0	0	1	0	0
2	0	0	0	1	1	0	0	0
3	0	0	1	0	0	0	1	0
4	0	0	0	1	0	1	0	0
5	0	0	0	1	0	0	0	1
6	1	0	0	0	0	1	0	0
7	1	0	0	0	0	0	1	0
8	1	0	0	0	0	1	0	0
9	0	1	0	0	0	0	1	0

10	0	0	1	0	0	0	1	0
11	0	0	1	0	0	0	0	1
12	0	0	1	0	1	0	0	0
13	0	0	1	0	0	1	0	0
14	0	1	0	0	0	1	0	0
15	0	0	1	0	0	1	0	0
16	0	0	1	0	0	0	0	1
17	0	1	0	0	0	1	0	0
20	0	0	0	1	0	0	0	1
21	0	1	0	0	0	1	0	0
23	0	1	0	0	0	0	1	0
24	0	1	0	0	0	0	1	0
25	0	0	0	1	1	0	0	0
26	0	1	0	0	0	1	0	0
27	1	0	0	0	0	0	1	0
28	0	0	0	1	0	1	0	0
29	0	0	1	0	0	1	0	0
30	0	0	0	1	1	0	0	0
31	0	1	0	0	0	0	1	0
32	0	0	0	1	1	0	0	0
33	0	1	0	0	0	1	0	0
34	0	0	1	0	0	1	0	0
35	0	0	1	0	0	0	1	0
36	0	0	1	0	0	0	1	0
37	0	0	1	0	0	0	1	0
38	1	0	0	0	0	0	1	0
39	0	1	0	0	0	1	0	0
40	0	0	1	0	0	0	0	1
41	0	0	1	0	0	1	0	0
42	0	0	0	1	1	0	0	0
43	0	1	0	0	0	0	0	1
44	0	1	0	0	0	0	1	0
45	0	1	0	0	0	0	0	1
46	0	0	1	0	0	0	0	1
47	0	0	1	0	0	1	0	0
48	0	0	1	0	0	0	0	1
49	0	1	0	0	0	1	0	0
50	0	1	0	0	0	1	0	0
51	0	1	0	0	0	0	0	1
52	0	0	1	0	1	0	0	0
53	0	1	0	0	0	1	0	0
54	0	1	0	0	0	0	0	1
55	0	0	1	0	1	0	0	0

56	0	1	0	0	0	0	0	1
57	0	0	1	0	0	0	0	1
58	0	1	0	0	0	0	0	1
59	0	0	1	0	0	1	0	0
60	0	0	0	1	0	1	0	0
61	1	0	0	0	0	0	1	0
62	0	1	0	0	0	1	0	0
63	0	0	1	0	0	1	0	0
64	0	0	1	0	1	0	0	0
65	0	0	1	0	1	0	0	0
66	0	0	0	1	0	1	0	0
67	0	0	0	1	1	0	0	0
68	1	0	0	0	0	1	0	0
69	0	0	1	0	0	0	1	0
70	0	0	1	0	0	0	1	0
71	0	0	0	1	1	0	0	0
72	0	0	0	1	1	0	0	0
73	0	1	0	0	1	0	0	0
74	0	0	1	0	0	1	0	0
75	0	0	0	1	1	0	0	0
76	0	1	0	0	0	0	1	0
77	0	1	0	0	1	0	0	0
78	0	0	1	0	0	0	0	1
79	0	1	0	0	0	1	0	0
80	0	1	0	0	0	0	0	1
81	0	1	0	0	0	0	1	0
82	0	0	0	1	0	1	0	0
83	0	1	0	0	0	0	1	0
84	1	0	0	0	0	1	0	0
85	0	0	1	0	0	0	0	1
86	1	0	0	0	0	0	0	1
87	0	0	1	0	0	0	1	0

Explication of headings:

Acres: How much farmland do you own in acres?

Rentalacres: How much land do you rent in acres?

Hunter: Are you a hunter? 1=yes; 0=no.

wHunting: Did you go hunting in the last 12 months? Yes=1 no=0.

WTA1: If you were allowed to charge hunters for access, what do you think would be a fair charge for a day of access?

WTAAm: Same as WTA1 for American hunters. It was not one of the survey questions, but during the interview process many subject stated a different price for American hunters.

WTA2: If you were allowed to charge hunters for access, what do you think would be a fair charge for a week of access?

WTA3: If you were allowed to charge hunters for access, what do you think would be a fair charge for a year of access?

ID	acres	rentalacres	Hunter	wHunting	WTA1	WTAAm	WTA2	WTA3
1	160	0	1	1				
2	1120		0	0	75			
3	3500	2500	0	0	25		150	500
4	160	0	0	0	100			
5	960	0	0	0				
6	480	0	0	0	250			
7	640		0	0	62.5			
8	2720	0	0	0	300			
9	800		1	1	100			
10	1120	2200	0	0	100		500	1000
11	2500	1500	0	0	100		500	1000
12	1920	0	0	0	100		500	1000
13	1800	0	1	1	50			
14	640	160	0	0	50		210	800
15	107	0	1	1				
16	3840	640	1	1				
17	1400	0	0	0	100			
20	5280	0	0	0	50			
21	1920	450	0	0	10			
23	1120	0	0	0	0			
24	480	480	1	1				
25	960	0	0	0	25			
26	2000		0	0	don't know			
27	8500	0	0	0	50		50	
28	2600		0	0	275			
29	6000		0	0	40			
30	640		0	0	25		100	200
31	960		0	0	50		100	200
32	320	0	0	0				
33	640	1760	0	0	25		175	750
34	3000	0	1	1				

35	5120	480	1	1	25			
36	4500		1	1	25			
37	1120	320	0	0				
38	6000		1	1	37.5		100	250
39	800	320	0	0	50		300	1500
40	800		0	0	50		350	1000
41	200	0	0	0				
42	640	0	0	0	no idea			
43	960	320	0	0				
44	3840		1	1	no idea			
45	640	480	0	0				
46	1280	1280	1	1	100		500	
47	360	0	1	0	20		140	1000
48	480	0	0	0	50		350	500
49	480		1	1	100	500	700	
50	300	0	1	1				
51	160		1	1	10	100		
52	800	0	1	1	100	700	Not an option	
53	1920	4480	0	0	350	1000	1000	
54	320	0	1	1				
55	160		1	1	100	500	100	
56	320	2800	1	1	50		300	1000
57	500	460	1	1	50		250	1500
58	2400	2240	0	0	50		500	1000
59	4160	1120	1	1				
60	320		0	0	no idea			
61	320	0	1	1				
62	3500	1120	1	0	no idea			
63	1440	0	0	0				
64	360	0	0	0				
65	640	1120	0	0				
66	1120	360	0	0	200			
67	2600		0	0	no idea			
68	160	2000	1	1	15		175	375
69	4000	3000	0	0	500			
70	480		0	0	no idea			
71	320	0	0	0				
72	160	0	0	0				
73	480		1	1	100		500	No idea
74	1280	0	1	1				
75	480	0	1	0				

76	2560	0	1	0	1000	7000	7000
77	640	640	0	0	100	500	1000
78	160	0	0	0			
79	480		0	0			
80	480	640	0	0	wouldn't have a clue		
81	1600	640	1	1			
82	2240	0	1	1			
83	3480		0	0	100	500	
84	1920	360	1	1	100	100	1000
85	1120	0	1	1	52.5	350	400
86	640	0	1	1			
87	960		1	0	20	70	No idea.